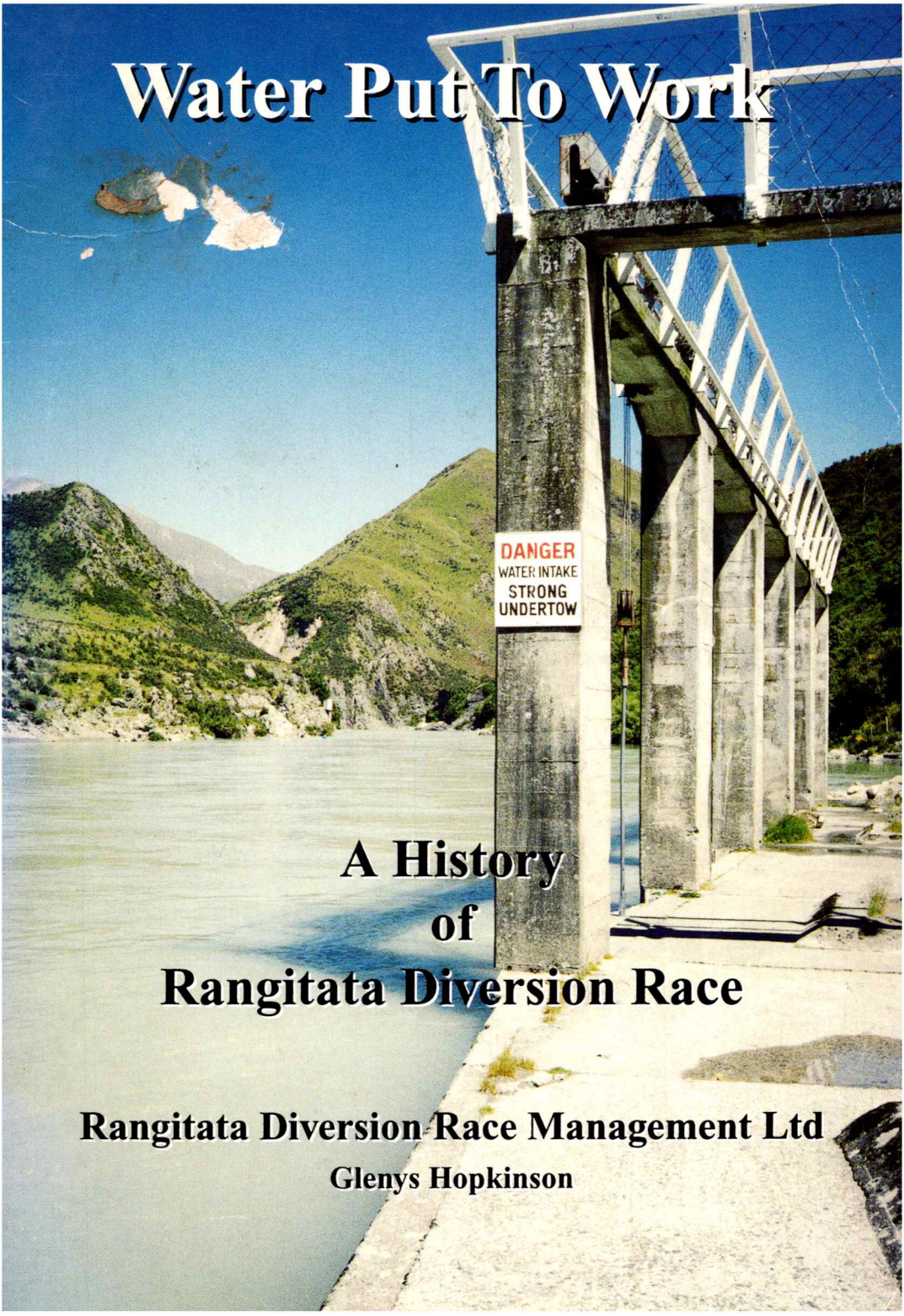
Water Put To Work



A History of Rangitata Diversion Race

Rangitata Diversion Race Management Ltd

Glenys Hopkinson

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Water Put To Work. A History of The Rangitata Diversion Race
By Glenys Hopkinson
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Foreword

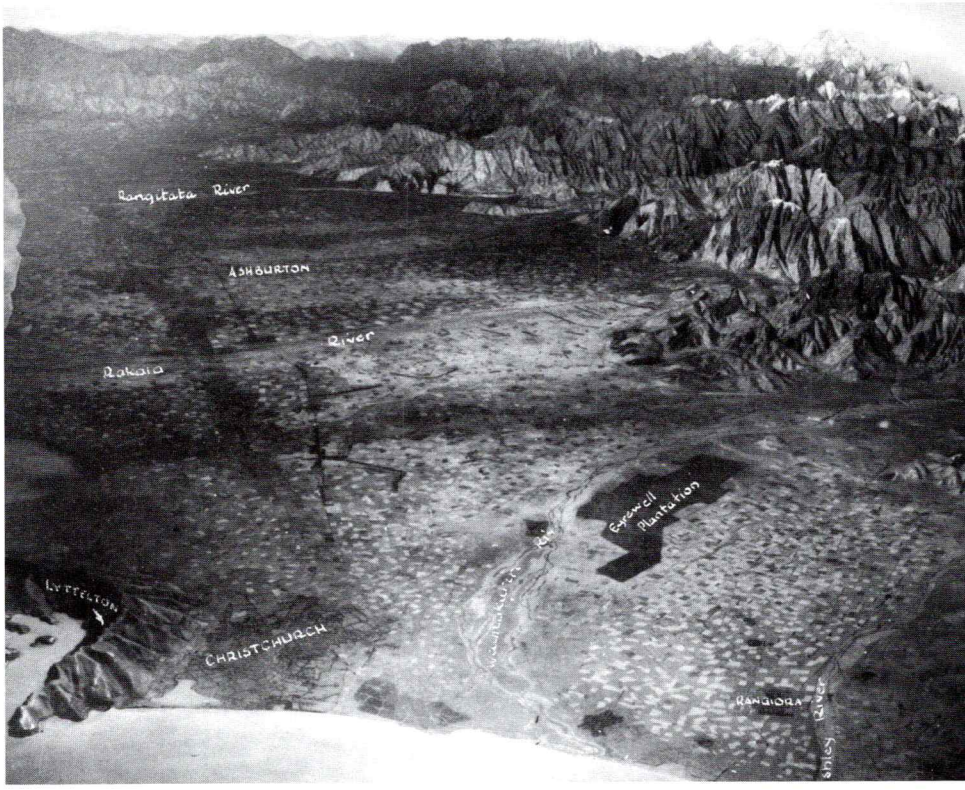
Locals talk about ''The Race'' with great passion, nostalgia and admiration.

The Rangitata Diversion Race is the pride and joy of farmers and other locals in Mid Canterbury in the heart of New Zealand's South Island.

Farmers, who watched its construction from the 1930s, and men, who worked on building it, retain close emotional ties with it.

This history looks for answers as to why an irrigation scheme has come to hold such a special place in their hearts and minds and a permanent place in local folklore.

It also examines why The Race was regarded as one of the most imaginative engineering feats in the world at the time, describing its construction, size, agricultural and economic impact and its future potential.



The caption to this early Ministry of Works graphic of a model in the then Christchurch Museum says "the major portion of the Canterbury Plains can readily be irrigated. So far only the Rangitata River has been tapped for irrigation. Two large rivers, Rakaia and Waimakariri flow unused to the sea". The model shows the Rangitata Diversion Race area from the Rangitata River at the top, Ashburton and Rakaia Rivers, framed by the Southern Alps and Christchurch in the foreground.

Introduction

The Rangitata Diversion Race is acclaimed as a triumph of vision and one of the most ambitious engineering feats in New Zealand.

It was also regarded as one of the most imaginative schemes in the world at the time, because of its blend of irrigation and power generation, combining the Rangitata Diversion Race with Highbank and Montalto hydro power stations.

Launched in 1930s Depression years to harness the mighty waters of the Rangitata and Ashburton Rivers to irrigate the Mid Canterbury plains, farmers were promised a four-fold increase in agricultural turnover and the unemployed were promised work.

Sixty years on, in 1996, The Race has achieved its target. About 500 farms, or 32% of Mid Canterbury's 200,000 hectare farmed plainsland, are irrigated by the 67 km raceway.

It generates an estimated $137.7 million annually in economic benefits to the Ashburton district, or $5,738 per head.

Gross farm income directly attributable to the scheme is conservatively estimated at $30.6 million and Highbank Hydro Power Station generates an average 90 GWh annually.

Locals are satisfied The Race has fulfilled its promise and has more to offer in the future. Company manager John Young says: "It is the lifeblood of Mid Canterbury."

It all starts here at the headworks at the Rangitata Gorge where water is diverted from the Rangitata River to the initial intake of the race on the right and on across 67 kms of Mid Canterbury plains.

The Rangitata Diversion Race starts amid panoramic scenery at the base of the boulder-filled Rangitata Gorge, surrounded by centuries' old, geologically unique, terraced hillsides. Set in the heart of New Zealand's mid-Canterbury plains in the South Island, water flowing from the Rangitata Gorge is diverted into the initial culverts of the race.

Raceways have been constructed along 67 kms of countryside, crossing and collecting water along the way from the Rangitata River at Klondyke and South Ashburton River at Mt Somers, carrying water to the Montalto Power Station on the way and ending at the Highbank Power Station at the Rakaia River.

Raceways flow through farms to irrigate about 64,000 hectares, or 32% of the total 200,000 hectares of mid-Canterbury plains. Other farms, not directly connected to the race, benefit from additional drinking water for their stock from the irrigation scheme.

The continuous supply of water has led to significant diversification, from mainly sheep and wheat farming to dairying, mixed cropping, horticulture and deer farming.

Another bonus is the race offers recreational and tourist attractions, fishing, duck shooting, canoeing and walkways.

Pioneers seek bold schemes

The Rangitata Diversion Race was a dream in the minds of Mid Canterbury pioneers from the time the vast 750,000 acre plain was first farmed in the mid 19th century.

Regarded as the largest area of nearly flat land in New Zealand, all land development was closely linked with water problems - water races to supply stock on light land or water courses to get rid of surplus water on heavy swamp lands.

Its mighty rivers, particularly the Rangitata and Rakaia, were regarded with awe and treated with respect by Maori and Pakeha. History records the dangers of fording them or establishing ferry crosses and bridges.

Fording the Rakaia was so dangerous in the 1850s, the government offered a prize to anyone coming up with a satisfactory ferry scheme. No-one did. Even fewer people tried crossing the Rangitata.

The Canterbury plains provide some of the most dramatic and geologically interesting country in New Zealand, with a backdrop of the Southern Alps and the country's largest mountain, Mt Cook, and a lineup of strong rivers flowing down to the Pacific Ocean.

In the 1860s, Canterbury's provincial geologist Julius Haast gained an international reputation for his discovery of fossil shells, plants and bones, in the area, and for his theory they belonged to an earlier glaciation period, the Triassic period 200 million years ago. He also found deposits of brown coal, clay, silica sand and limestone.

Harnessing those waters to irrigate the plains became an important part of Mid Canterbury's history.

The discovery of Maori ovens, shelters, rock drawings and artefacts, like adzes, greenstone chisels and wooden bowls, along with moa bones dating back 500 to 600 years, indicated nomadic hunting and food-gathering tribes had passed through but rarely settled.

Despite the great rivers, which had peculiarly few tributaries, early European pioneers in the 1840s recorded a "want of water, unusual for New Zealand" and "no fresh water to be obtained" on their journeys of discovery.

Harnessing those waters to irrigate the plains for the planned agricultural settlement became an important part of Mid Canterbury's history, filled with Kiwi ingenuity, controversy, acrimony and eventually bringing prosperity and production.

Ideas for building irrigation schemes had been bandied around the region right from the start. The establishment of the Ashburton County Council in 1876 provided a focal point for providing facilities like irrigation, water supply, bridges and railways.

The subject of irrigation moved into the public arena and has stayed there ever since.

By the late 1880s it had even reached the Provincial Council. Debate centred on the merits of open channels or pipes.

Initially, Mid Canterbury soil was variously described as, "reasonably fertile, easily worked and healthy stock country" to "poor land carrying one sheep to three acres."

Drought spurs race demand

Sheep and wheat provided the main source of income. Other farming, like cropping and dairying, depended on the fertility of the land.

At the same time new developments in refrigeration raised the possibility of exported frozen cargo, expanding farming horizons, from an emphasis on wool to export mutton and lamb as well.

Some runholders started building water races in the 1860s, cutting short channels from rivers to supply their stock and homesteads.

Charles Reed has been credited as the first man to successfully demonstrate open water races, building a five mile race from the Ashburton River into the centre of Westfield where it formed a swamp. Later he extended it to 12 miles, tapping into neighbouring creeks to irrigate his orchards and paddocks.

Duncan Cameron is credited with establishing the first systematic water supply, 40 miles of races and channels in Springfield.

In the early 1870s the Provincial Council authorised a start on the Malvern water race and voted 25,000 pounds for a water supply for the Ashburton plains.

But the council never produced the money.

Following drought in 1878, a deputation urged the Ashburton County Council, then in only its second year, to promote a scheme to supply water to Ashburton and Rakaia plains.

Research showed irrigation could turn arid land into productive pasture for the benefit of the nation.

Later that year, after a poll of ratepayers, the council appointed engineer William Baxter and voted 10,000 pounds for water supply.

The next year, Thornton and Bull's tender for a preliminary survey was accepted and James Weir Company started work on a dam and weir at Pudding Hill, northwest of Methven. Water flowed in on January 31 1881 and the system was rapidly extended.

By 1882, 400 miles of channels were in use and by the late 1890s few farmers needed to use water carts.

As water supplies grew, so did the demand, spurred on by drought in 1886.

A bold scheme in the 1880s, by Ashburton County engineer William Baxter, proposed building an eight-and-a-half mile tunnel to bring water from the Rakaia River gorge to the plains.

It proposed irrigating five blocks of land covering 396,000 acres from the Rakaia, Rangitata and North and South Ashburton Rivers and tapping into Lake Heron.

Experiments on a 90-acre Elgin block, known as "Irrigation Farm," were so successful, the council decided the benefits had been clearly demonstrated and further experiment was unnecessary.

Calls for irrigation schemes continued and in 1893 Mr William Allan, Acton Estate manager, set up and successfully operated an scheme which convinced the council of its benefits.

Just before 1900 Sir A. Dudley Dobson prepared estimates for another one.

Research work "of a very practical type," carried out at Seafield by Lincoln University and Lands and Survey, showed irrigation could turn arid land into productive pasture.

RDR is given the go ahead

Extensive irrigation was in place in Mid Canterbury after the turn of the century.

Johannes C. Anderson, in Jubilee History of South Canterbury, published in 1916, says the dryness of the plains in Ashburton County was "in a measure relieved by extensive irrigation works, the large rivers being tapped at various suitable points, and the water led in races across dry area, increasing the fertility and carrying capacity to a very marked extent."

However, further investigations were put on hold until massive unemployment in the 1930s depression years sparked new interest in the hope of providing work.

The need for radical government solutions to improve farm productivity and get workers off the dole sparked new interest in building irrigation schemes to overcome both problems.

A topographic survey was started in Mid Canterbury in October 1933, extended to South Canterbury in 1937 and later to North Canterbury.

On October 27 1933, the council met other local bodies and government department representatives to discuss irrigation of the plains.

As a result, Dr Grange of the Department of Scientific and Industrial Research carried out a soil survey to determine the degree of water deficiency and determine dependable river flows and Mr J.R.Fleming did a farm-management study.

On the area irrigated, carrying capacity has increased from one to six sheep per acre.

The present irrigation scheme was planned, started and spearheaded by irrigation engineer Mr T.G.Beck, until early 1944, when Mr J. O. Riddell took over.

The scheme was under the direction of Mr J. Wood, Engineer-in-Chief of the Public Works Department until 1940, when Mr L.W. Newnham succeeded him.

American-type meteorological stations were established to record humidity, rainfall, temperature, evaporation and wind statistics.

Early on it was recognised that irrigation was primarily to solve agricultural problems.

Three agriculturalists were co-opted to work under Mr C. W. Stanton, an irrigation officer with the Department of Agriculture.

Their roles were to supervise agricultural aspects of irrigation demonstration areas, collect data, advise farmers on preparation and techniques for irrigation and advise Public Works officers on agricultural aspects of design and construction.

As a result of the investigations, the decision was made to build the Rangitata Diversion Race for irrigation and power generation.

Work was well underway when World War II broke out in 1939 and interrupted construction for a time.

Keen interest was taken in developments and, from February 1937, critical experiments were carried out on irrigation of more than 36 acres on Mr Hammond's Winchmore property near Ashburton where intensive grazing had begun.

A 1944 Department of Agriculture report said carrying capacity of the land had been increased from one to six sheep per acre and "indicates the possibilities of more extensive irrigation."

Studies show farmer gains

The report continued: "The original outlay in preparing the land and establishing permanent pasture is paid for in the first year.

"No additional labour was necessary. Permanent high-production pastures with a close sward are possible under irrigation.

"The expense of re-sowing pastures every three years is obviated. The grass grub problem has been solved.

"There is a substantial increase in the weight of wool and lambs. The ewes are healthy; they show no signs of worms or foot-rot.

"These light soils in this climate are ideal for irrigation and respond remarkably to it."

Results from irrigation on Mr C. E. Kerr's property at The Levels over the 1942-43 season showed land considered one sheep to the acre could carry four to six sheep and removed past hazards of uncertain rainfall for crops.

One report said the greatest single gain would be the increasing fertility of irrigated areas.

This progressive build-up of Mid Canterbury soil fertility would be the greatest single asset of the province.

Water - key to life

The grim years of the Great Depression in the 1930s had convinced Minister of Public Works Bob Semple and many New Zealanders of the vital necessity for greater population, production and employment.

"I have always been impressed with the advantages which irrigation offers in this respect, especially in the vast open spaces of Canterbury and Otago," said Mr Semple.

"When it is possible, as in this instance, to generate electric power as well, a double blessing is conferred on the land.

"For the last 30 years the rural production and population of the Canterbury plains has remained practically stationary,"

Mr Semple said in a foreword to a government booklet, Water Put To Work, promoting the scheme and trying to bring critics on side.

"We as a nation cannot afford the continued idleness of such extensive resources not only for our own good, but for the benefit of the world at large."

The colourful Minister in the first Labour Government, was a powerful orator who loved talking statistics and generally did not use speech notes.

He, himself, had been unemployed, "a swagman," walking the country looking for work, a swag on a stick over his back carrying all of his worldly possessions,

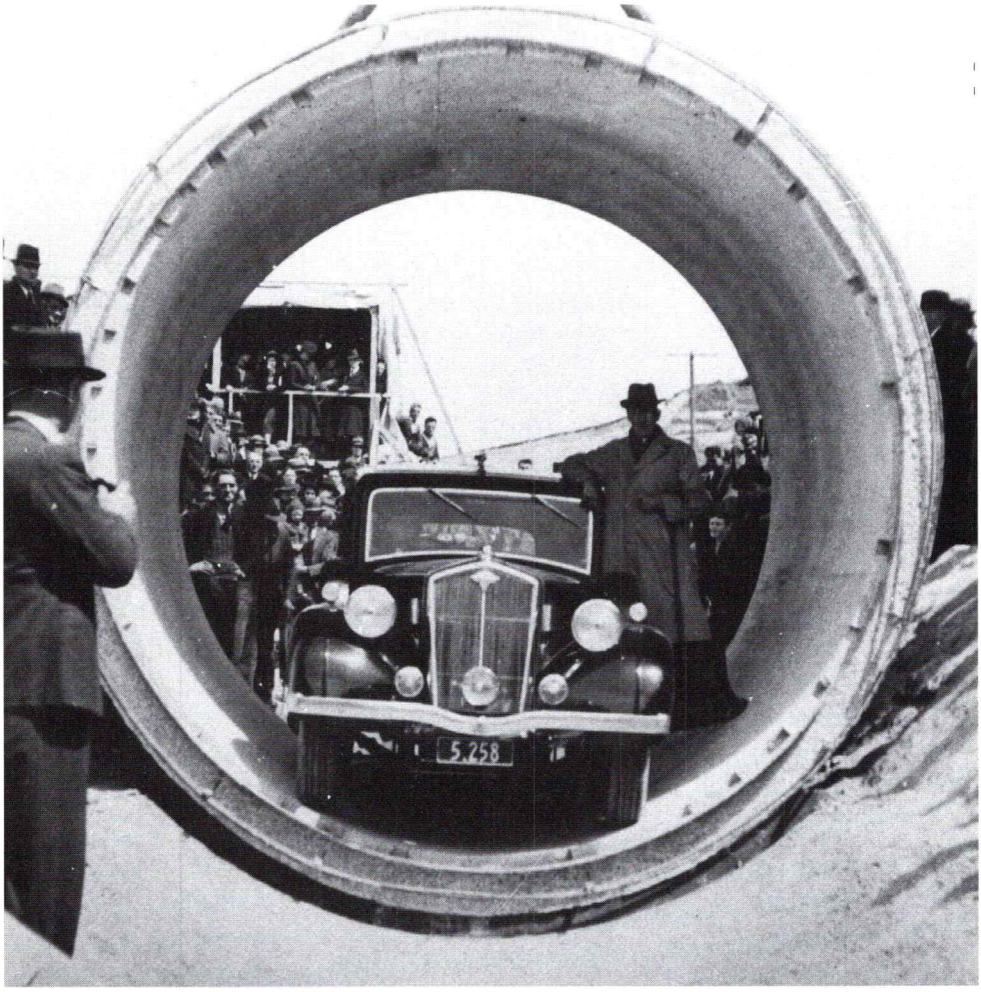
Initially, the Race was started as a pick and shovel job to get the unemployed off the dole and into work during The Great Depression.

Later, earth-moving equipment was brought to New Zealand for the first time and Mr Semple gleefully drove a bulldozer over the wheelbarrows.

Mr Semple was revered by the men, not only for providing work but for looking after their interests in hostile conditions.

He used his Ministerial powers to personally intervene and ensure the men were issued with wet weather gear in Mid Canterbury's harsh winter climate and that the size of their tiny, cramped living quarters was increased. In their eyes he could do no wrong.

So on the historic day, on October 19, 1940, he drove his car into the huge siphon at Surrey Hills.



This famous photo of charismatic Minister of Public Works Bob Semple and his ministerial car inside the first concrete pipe laid for the Surrey Hills siphon on October 19, 1940 epitomizes the magic of the Rangitata Diversion Scheme.

The photo shows off the exceptional size of the pipes and reflects, in one shot, all the challenges and achievements of constructing the mighty irrigation scheme.

The colourful Minister in the first Labour Government, a powerful orator who loved talking statistics, won the day. He pushed through the irrigation scheme despite the 1930s Depression, World War II and what he called "fair-minded critics."

Work began on the scheme on April 2 1937 and was completed in November 1944. Race water first generated electric power at Highbank power station on June 8 1945. Expected to cost 1.5 million pounds, it ended up costing 2 million pounds.

Semple puts water to work

When Mr Semple opened the Highbank Power Station in 1945 the crowds turned out to welcome him.

Some had hoarded their war-time petrol rations to be sure of being there.

"Let us therefore go forward into the era of hope that will follow the war, fully resolved to achieve the objectives that lie within our grasp," Mr Semple said.

His theory was that water that ran to waste was to be put to work, diverted along a thousand reticulating races, flowing gently over thirsty pastures and dessicated soil to mobilize the latent forces of Nature.

Energy that was normally dissipated in the riverbed was to be controlled in smooth running streams until it dropped quickly as a surging torrent to drive generators and create 360,000 horse power.

"On these plains water becomes the master key to life; the magic wand that activates the growth of plants.

In this new role it has a power potentially greater than in the power-house, because the resources of the soil and the sun's radiated energy are combined for the production of food."

Mr Semple's gift of oratory and powers of persuasion failed to quell objections from some farmers, who feared seepage from race channels, destruction of their assets during construction and "problematical benefit."

However bright the future prospects of irrigation in Canterbury, he said little could be achieved without the willing co-operation and effort of all concerned.

Temuka MP Mr T.D.Burnett, standing in for Mid Canterbury MP, Major Arthur Grigg, who was away at war when Mr Semple laid the first pipe at Surrey Hills, said: "Had it been left to me I would have closed down this scheme until after the war."

One person in the crowd disagreed, calling out: "Never on your life; carry on Bob."

Timaru MP Clyde Carr was also in favour of the scheme.

He said carrying on the work was illustrative of the good old British motto: Business as usual.

Undaunted by the opposition, Mr Semple told a huge crowd of 400, who gathered around him in the sloping paddock, the race was a vast undertaking, equal to anything in the world on a population basis.

For many who were there that day, Mr Semple, with ministerial car inside the pipe, and his glowing description of the vastness of his vision and of the race itself, remains fixed forever in their memories.

"We are here waging war with nature and with forces overseas.

"Two wars are going on, but we have the utmost confidence of the men in each war to carry out the struggle," he said.

He predicted the ultimate development of the water resources "will more than double the human population of Mid Canterbury and will increase the agricultural turnover at least four-fold."

Launching into the statistics he loved, and revealing the thoroughness of his research, he outlined the scheme in detail.

Astounding as it may seem, the scheme was created almost exactly as he prescribed and within the next three years.

Bob Semple's vision - irrigation, power generation, jobs - gets underway at Klondyke in 1937. The famous steam dragline and a Rushton Bucyrus 37RB dragline join forces with five bulldozers to get ready for "The Big Cut" to divert water from the Rangitata Gorge into the race intake. Klondyke single men's camps is at left rear.

Sixty years on, it continues to perform and achieve the objectives he said it would.

''The Rangitata Diversion Race will be 42 miles long, commencing in the Rangitata River Gorge and ending at the Highbank power plant,'' he said.

''The excavation of the race involved moving almost three million cubic yards of earth, and to date more than two thirds of the work has been completed.

''Modern plant was used and the greatest rate of output in any one month was 280,000 cubic yards.

"The average cost of the excavation has been approximately one shilling per cubic yard, allowing for all trimming and finishing work including the formation of embankments.''

He described the number, size, length and weight of the pipes and engineering solutions to overcome problems of unstable country.

He described the pipe manufacturing plant, designed and built on site, and the Highbank Power Station to generate 30,000 horse power of electricity for five months over winter when race water was not required.

Despite all Mr Semple's persuasive powers, opposition to the scheme was so strong by 1941 a Seepage Protection Association was formed, led by a well-known sheep dealer Robert D. Robinson, who later farmed Coniston.

The group toured other similar irrigation works, like one at Seadown near Timaru, and called on Mr Semple to stop the scheme until the Seadown scheme had been fully investigated.

Two years later, and with a new name for their organisation, Ashburton County Irrigation Problems Association, they demanded a study of the Rangitata race by a ''competent'' overseas engineer.

However, by that time, local tests were already underway.

Rangitata Diversion Race

Physical Description

- 67kms long
- 10m wide
- 3m deep

Structures - siphons, checkgates, radial gates, spillways

Water Source

- Rangitata River 30.8 cubic metres per second
- Ashburton River 3 cubic metres per second

(right to take up to 7 cubic metres per second)

Distribution System

- Irrigation
- Mayfield Hinds 16.5 cu.m/sec. 31,988 hectare.
- Valetta 4.4 cu.m/sec. 7,265 hectare.
- Ashburton Lyndhurst 13 cu.m/sec. 24,589 hectare

Power Generation

- Highbank 25.2MW (104m head)
- Montalto 1.9MW (7m head)

Stockwater Potential

- Up to 1.5 cu.m/sec.

The local tests revealed the amount of water lost afforded grounds for apprehension, according to historian, Dr W. H. Scotter in his book "Ashburton a History of Town and Country."

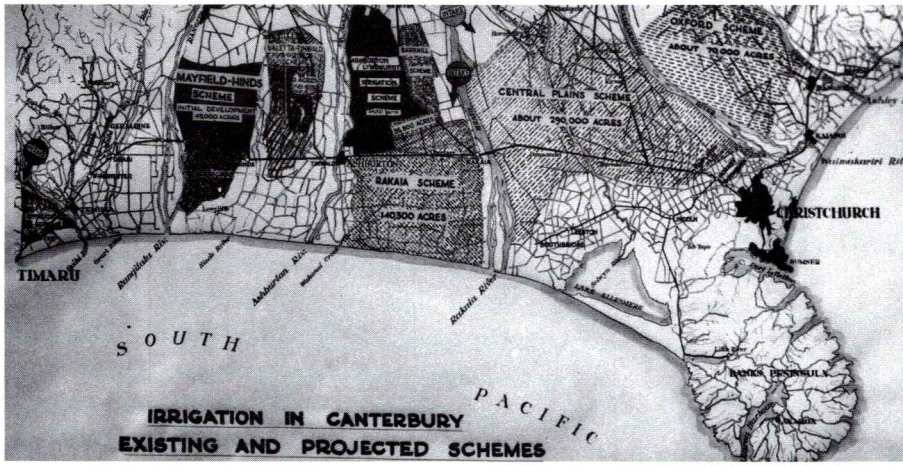
Mr Semple assured them seepage would be kept to a minimum and the Ashburton County Council set up gauges in shingle pits so farmers could obtain reliable data if they wanted to take action against the government.

Instead, the results served the opposite purpose and removed suspicion that water levels were greatly affected by the new channel. Dr Scotter said it was understandable farmers had been worried about seepage.

Up until recent times, farmers and the Ashburton County Council have continued to worry about it.

Over the years, the Ministry of Works and Development was not convinced seepage could occur and put it down to the wet season.

However, seepage tests continue to be conducted, just in case.



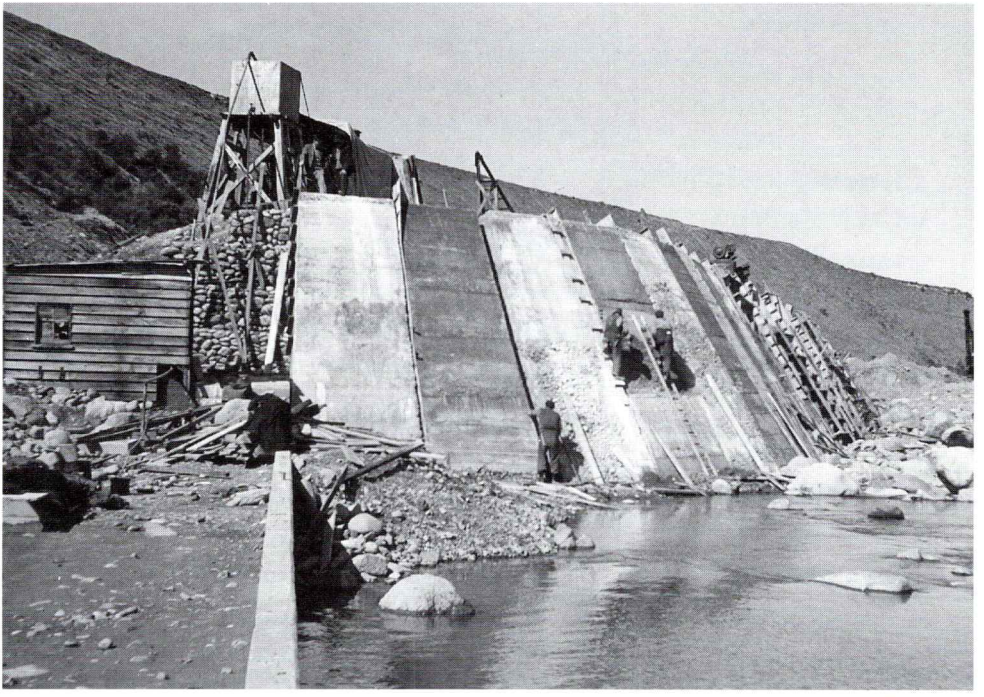
An early graphic of Mayfield-Hinds, Valetta-Tinwald, Ashburton-Lyndhurst and projected schemes.

Rangitata Diversion Race Management Ltd
Ownership & Management

Shareholders	Shareholding	Operational Cost Sharing	Directors
	%	%	
Electricity Corporation of New Zealand	37.5	40	3 (B)
Mayfield Hinds Irrigation Society	12.5	26.6	1 (A)
Ashburton Lyndhurst Irrigation Society	12.5	19.9	1 (A)
Valetta Irrigation Co-operative Society	12.5	7.5	1 (A)
Electricity Ashburton	12.5	5.1	1 (D)
Ashburton District Council	12.5	0.9	1 (C)
	100%	100%	8

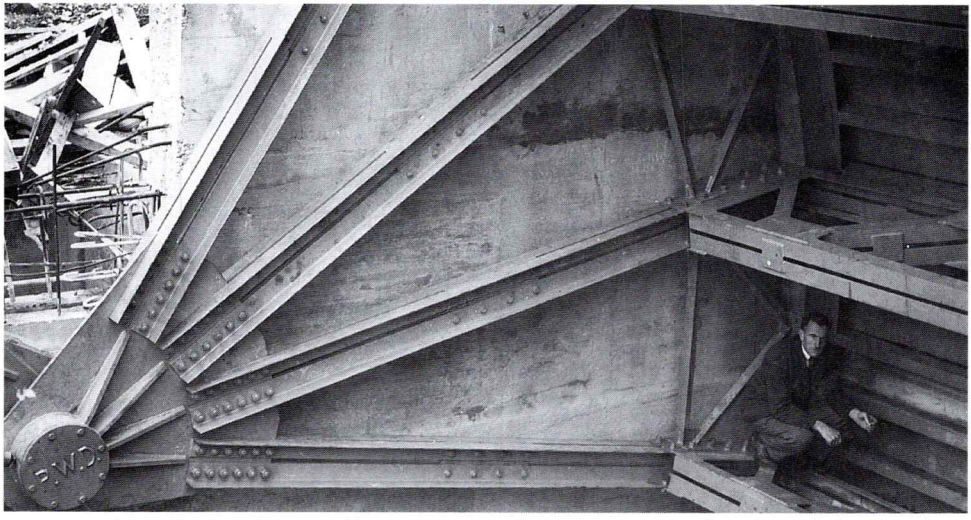
The company operates as a non profit making co-operative.

The majesty of the steam dragline, driven by Joe Madden, with the Bay City 65, driven by Bill Hopkinson, excavating at the headworks about 1940.



No stone unturned to protect the race intake at Klondyke from the mighty forces of water from Rangitata Gorge.

Race packs powerful punch of engineering wizardry



Sheer size of radial gates at the control house contrasts with plant supervisor Bob Begbie tucked in on right.

The Rangitata Diversion Race is a 67km long canal which carries about 30 cubic metre per second of water, diverted from the Rangitata River at Klondyke, north-west across the Mid Canterbury plains, to the Rakaia River at Highbank.

A second intake on the South Bank of the Ashburton River diverts up to about 7 cubic metres per second of water, when it is available, from the river into the Rangitata Diversion Race.

Three community irrigation schemes, two hydro-electric power stations, Ashburton District Council stockwater race system and various private stockwater and irrigation schemes are supplied by the race.

The Mayfield-Hinds, Ashburton-Lyndhurst and Valetta irrigation schemes serve a total contract area of about 63,842ha.

Irrigation has priority of supply during the irrigation season extending from September 10 to May 10 each year.

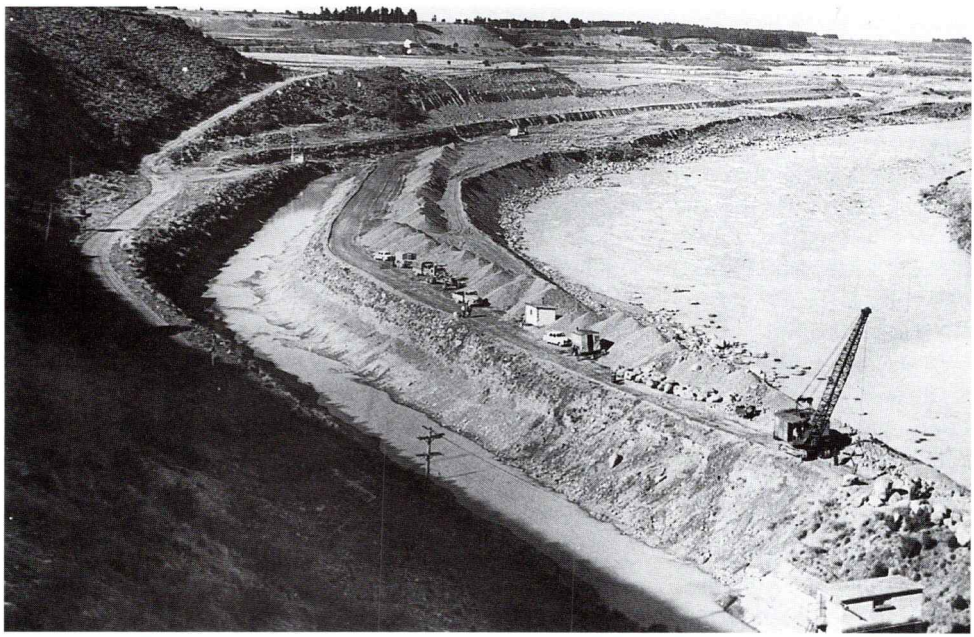
During the rest of the year, Highbank Power Station, operated by ECNZ and located at the Rakaia end of the race has priority of supply.

The other power station, Montalto, located 1.5 kms downstream from the Mayfield-Hinds Irrigation Scheme, is operated by Electricity Ashburton.

Major control structures built along the race include the Rangitata intake and sandtrap, checkgates, spillways and siphons passing under rivers and streams which cross the Race.

The most spectacular are the 1.5 miles of siphons which convey water around the toe of Surrey Hills and its 400 ton anchor blocks.

Coffer dam at the intake before the river runs into the race.



And the river runs through and Rangitata Diversion Race sets course across Mid Canterbury.

Klondyke - "heaviest mile"

Over five million cubic yards of material, soil, silt and boulders, were excavated during the construction of the Rangitata Diversion Race.

About 280,000 cubic yards were excavated each month at a cost of one shilling per cubic yard.

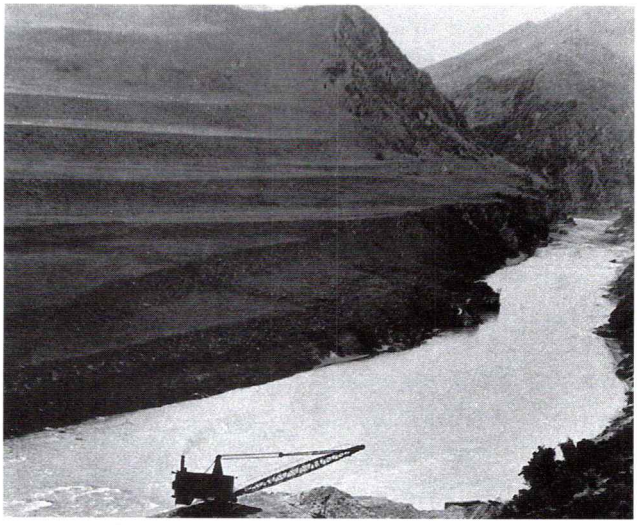
The race was planned to be 42 miles long, 25 feet wide at the bottom at a depth of water of nine feet six inches, with a fall of one foot per mile. Average velocity of water flow was to be three feet per second.

The area approaching the intake from the Rangitata Gorge, at Klondyke, was called "the heaviest mile," where 450,000 cubic yards had to be shifted by dragline and bulldozer.

Picks and shovels were the tools of the day when work started on the massive project on April 2 1937.

The scheme was devised to provide work for the unemployed and to irrigate Mid Canterbury to improve the land's stock carrying capacity.

The first section was dug at Klondyke at the Rangitata Gorge, about one mile down from the race intake, where workers shovelled out the huge boulders, soil and silt and threw it over the side.



Panoramic glacial formed terraced landscape at Rangitata Gorge.

As the trench deepened to the required 12 foot depth, they had to shovel in stages.

Timber landings were built on three levels at the sides of the trench and the men dug out the debris and threw it up to a man at the next highest level, who, in turn passed it up to the man at the top.

The first machinery to arrive was a steam dragline, Public Works Department 943 speeder face shovel, RD7 Caterpillar bulldozers and attey wagons.

Excavation had started a mile down from the intake so caissons could be built and later floated up to the intake before the Rangitata River could be diverted into the race.

The huge 12 foot square caissons were built in a line, one behind the other, and filled with compressed air at each end to make them light enough to be floated up to the intake.

Strengthened and reinforced by carpenters, they were built to be permanent so they could not be destroyed even by the largest flood in the river.

At the same time, pump attendants worked around the clock to keep water out of the channel and away from the construction.

Cranes moves in for Big Cut

Bill Hopkinson describes preparations for Big Cut

When construction of the caissons was nearing completion at the Race intake, a major excavation task was looming.

This project was called "The Big Cut."

It was a huge channel to be excavated from the intake around the men's huts to join up with the already-completed race along the terraces further downstream.

As the engineers needed three one-and-a-half yard draglines and there were only two on site, the 37RB Ruston Bucyrus and the steam dragline, the foreman, Ken Ashton asked me to go over to Methven and take a D.8 bulldozer and tow the Bay City 65 one-and-a-half yard machine back to the headworks.

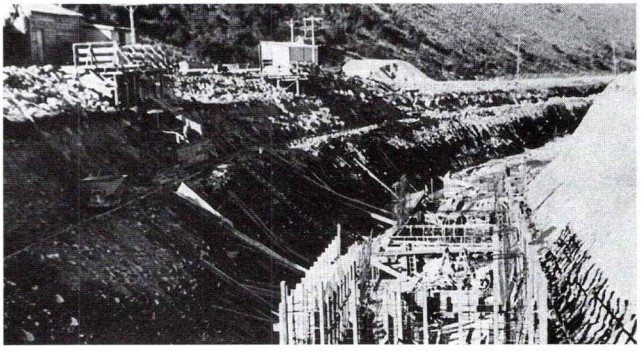
Because this machine weighed 51 tons, there was no suitable transporter available. So I took one of my bulldozer mates, Len Robinson, with me to Methven to drive his bulldozer and tow the Bay City 40 miles across Mid Canterbury back country.

I told Len to use fourth gear and when we came to all the rivers, the dragline was too heavy for the bridges, so I had to drive it through the rivers. The journey took four days to complete and we were then able to begin "The Big Cut."

This excavation involved boulders larger than the bucket and I had to develop techniques of working the drag chains under each side of the boulder to bring them out in a novel fashion.

The floorman's job was to maintain the water supply to the boiler, bag and winch the coal to the bunker, grease and maintain the machinery, help with repairs and maintenance and keep the engine clean.

Both steam draglines had previously been used to excavate the Hawkswood cutting for the railway line to Kaikoura and had also worked near Parnassus.



Caissons under construction at the headworks at Klondyke.

Pumping out water as caissons floated up to the intake for The big Cut.

All go to divert river to race

When the caissons were ready, the race was filled with water to start floating them up to the entrance. Ropes were attached on either side to keep them in the centre of the race.

As they moved upstream, pump attendants were kept busy pumping out water to keep them afloat.

After the caissons had been floated into place above the intake, the channel was filled in to keep the river from flowing down into the race.

Great care had to be taken during the transfer of the caissons to ensure everything was under control in case of a major flood which could have swept them all away and filled the partially excavated race below.

In what was dubbed The Big Cut, three yard and a half draglines were called in to connect up to the race from the intake and filling in the opening made for the caissons to pass through.

A control house was built on top of the intake structure and central, radial gates positioned between the upright piers with control wheels and drum connected to wire lifting ropes so the gates could be lifted to let in the water through the tunnel below.

Working at night in sub-zero temperatures, they called it "Fairyland."

A bridge with electric motors allows the raceman to lift or lower them to let in water or shut the gates to close it off. The bridge also provides access for repair and maintenance work.

With the caissons sunk into river, the Rangitata River could be diverted into the tunnel to supply water to the race.

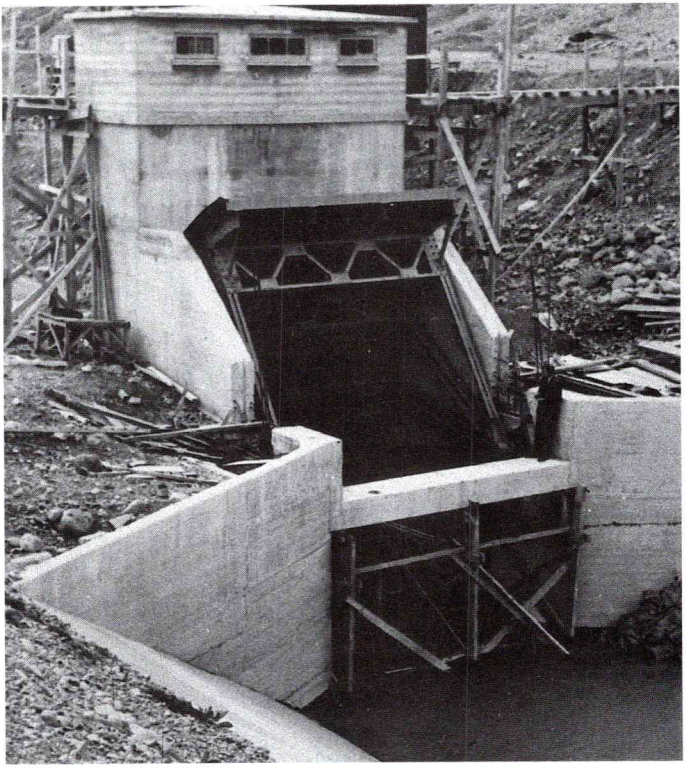
Protection work around the intake was let by tender to a Christchurch building contractor Jack Tait, who built the framework over boulder-filled banks to stop the force of the Rangitata River damaging the whole structure and the race.

An English machine, a Rushton Bucyrus 37RB yard and a half dragline, which is still used today, and a yard and a half steam dragline, were used to excavate the race at the headworks.

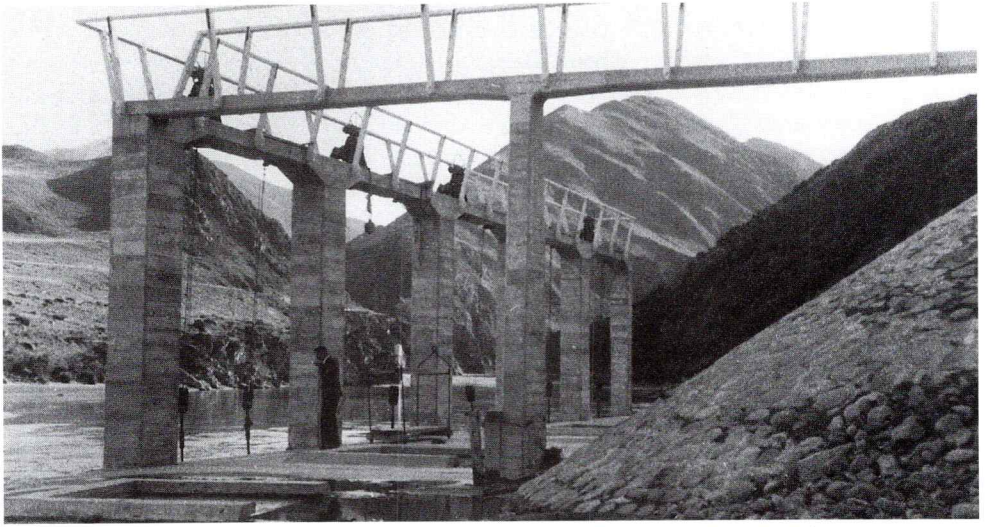
Five Caterpillar D8 bulldozers worked close by to clear away the shingle, boulders and silt to prevent the draglines getting blocked up.

The Big Cut was a huge earthmoving operation. Improvisation was needed like when the steam dragline was excavating the race and the 37RB dragline had to be sited on top of the bank to clear away material because bulldozers could not work up there. The bulldozers stayed down below and pushed away the material.

Sometimes a pull shovel, which could dig harder material than a dragline, was attached to the Bay City 3734 for a tough stretch of work. Ten cubic yard attey wagons were used to collect the material and take it away.

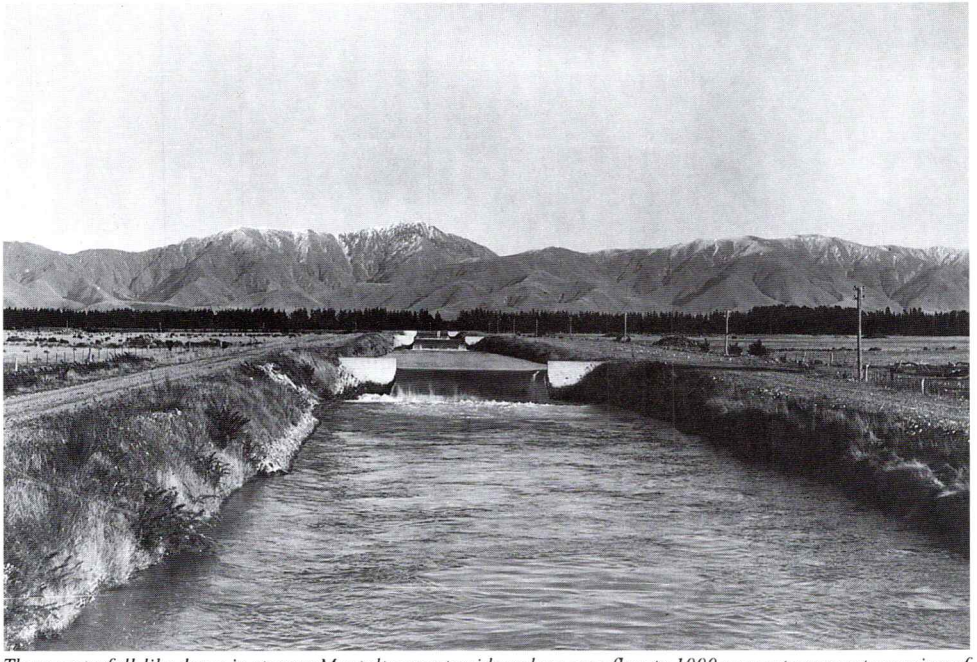


First water flows from the Rangitata River under the control house into the race.



Central gates with wire ropes connected to control gear and electric motors lift the gates to let in the water.

Carves way on to Montalto



Three waterfall-like drops in steeper Montalto countryside reduce race flow to 1000 cusecs to prevent scouring of race bed and banks. The drops were removed when Montalto Power Station made use of the extra fall.

Work continued on excavating the race from Klondyke to Montalto.

Because the land dropped more than one foot per mile, three drops were constructed to take the fall from the ground to avoid the race running too fast and scouring the banks.

Three drops, about eight feet high, were built to let the water fall like a water fall and level off.

Since then the drops have been removed when Electricity Ashburton built a remote control power station, making use of the extra fall to drive the generator at the Montalto Power Station.

The first road bridge in the scheme was built over the race at Klondyke near the single men's camp.

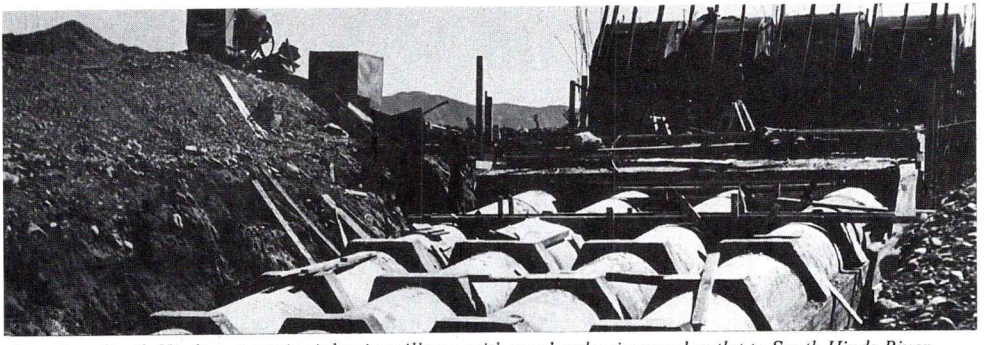
One of the most ingenious constructions along the race is the South Hinds automatic siphonic spillway, one of the few automatic operations in the scheme at the time which attracted a lot of interest.

A lineup of four galvanised pipelines was inserted in the ground to channel water under a structure by the outlet to the South Hinds River.

If anything went wrong with the pipeline around Surrey Hills or The Birches and the water built up to a certain height, the gates would be closed off automatically.

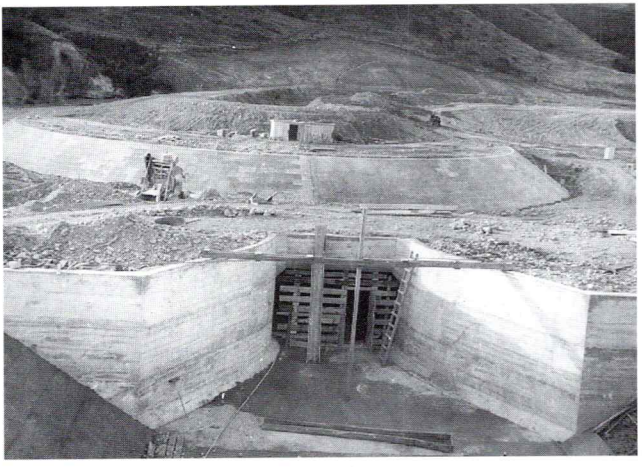
One of the pipes would then throw out a full bore of water, quickly emptying out an overflow of water from the intake.

It was designed to save Anama and Mayfield from flooding.



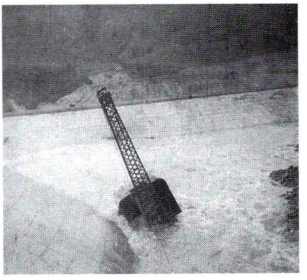
Ingenious South Hinds automatic siphonic spillway, with quadruple pipes and outlet to South Hinds River.

On show, as one pipe automatically throws out a full bore of water.



Intake to siphon taking race water under Hinds River.

Dramatic dragline rescue at S. Hinds



Speedo dragline in a spot of bother at South Hinds siphon.

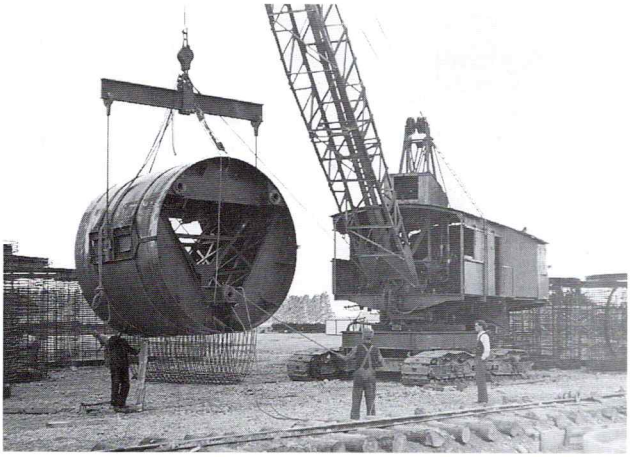
The rain-fed South Hinds River is well-known for rising and flooding quickly.

It was the scene of a dramatic rescue operation in early 1942 when two draglines were caught in its turbulent waters, running eight feet above normal, with big boulders crashing down.

Extensive protection work has been done and check gates built to protect the area from flood and erosion.

A siphon now takes the Rangitata Diversion Race water under the Hinds River to set course for Surrey Hills.

Surrey slips spell trouble



Reinforcing cages and 12 foot diameter pipes built at The Birches open air factory for Surrey Hills siphon.

Dangers of working on Surrey Hills bog.

Unstable Surrey Hills land provided the biggest drama and sparked off the greatest engineering wizardry of the whole scheme.

Old shepherds had warned the engineers they would have trouble building an open race around Surrey Hills because the unstable land would slip, particularly after heavy rain

However, work continued and draglines and bulldozers carved out the race through the boggy hillside.

The work was made harder because Cletrac bulldozers, not higher quality ones, like Caterpillar bulldozers, were used and many broke down.

To avoid all three bulldozers getting bogged down at once, they used only two bulldozers at a time. They used the third one to pull out the others when they were bogged, towing them out with a long sling wire rope they devised for the job.

The bulldozers had to clear a flat track for the draglines to work on as theyexcavated the trench.

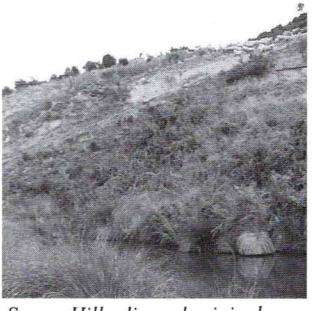
A new Bay City dragline, with a pull shovel was brought in to widen the race and clear the clay and bog, called a greasy bog because of the clay soil composition.

Despite the difficulties, the open race at Surrey Hills was built to specifications.

It was dangerous work on the slippery hillside. But it all had to be abandoned.

The big slip took off probably over Christmas 1938 and January 1939 when most of the job was closed down for holidays.

Undaunted, the engineer in charge, T.G. (Gordon) Beck, is said to have rung up Minister of Public Works Bob Semple and told him the race would go on.



Surrey Hills slip and original race, in front, still visible today.

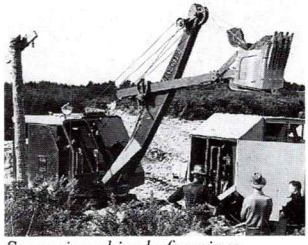
Giant pipes save the scheme

Suddenly the pipe factory at The Birches was building eight huge pipes a day, each requiring 90 bags of cement, and reinforcing cages bigger than had ever been seen before.

Shingle was dug out of the South Hinds River with Bay City 3734, where the shingle was not too bouldery or coarse, to make the cement for the pipes.

Three-eighth metal shingle screens were designed to sift out shingle of the right size on to a truck so it could be transported to the pipe factory.

Gantry cranes were built to lift up the 28 ton pipes and transport them to the site. Part of the casing was made at Washdyke and transported to the Birches.



Screening shingle for pipes.

Two gantries were sited at The Birches and one at Surrey Hills. Railway lines were set up for the gantries to travel on and anchor for stability.

Spreaders were built and chained to the pipes to prevent them being damaged during transport.

Cranes could pick up the pipes and travel back and forth, to put them on to transporter, a Caterpillar D8 bulldozer without its blade.

Further siphons were laid under the North Hinds River as the race continued beyond Surrey Hills and on to the south branch of the Ashburton River.

The siphon at the south and north branches of the Ashburton River are major structures, the first to let water out of the race and into the river in emergencies as well as taking water from the river into the race.

Spectacular siphons big enough to take a car

Three types of siphons were used, all built at a plant near Surrey Hills called The Birches. Two types were to by-pass rivers and the third to by-pass unstable country at Surrey Hills.

The siphons crossing North and South Ashburton Rivers are precast, reinforced pipes, 11 feet in diameter, nine inches thick and weighing 18 tons, founded on haunches deep below the shingle of the riverbeds.

The second type, rectangular in cross-section, were built on site and used to cross the North and South Hinds, Taylor's, two Bowyer Streams and Dry Creek near Methven.

The Surrey Hills siphons, covering one and a half miles, are one of the most spectacular engineering feats of the whole race because of their size and the high pressure they have to withstand, up to 123 feet of water at the deepest part.

They are 12 feet in internal diameter, have a 10 inch thick shell and weigh 28 tons. Anchor blocks, weighing 400 tons, are placed at strategic points at the base of the hills.

The siphons were remote controlled until the 1970s when the systems were removed because power poles began to fail.

Hub of Birches open factory

Sited in remote back country, by an old orchard, The Birches was a hub of activity, the centrepiece.

It was, in fact, a huge manufacturing plant, an open air factory, with a large forge and fitter and turner workshop which produced the major structures along the Rangitata Diversion Race

It was also a maintenance workshop for the machinery, draglines, bulldozers and gantries.

At one stage there were 27 tradesmen, carpenters, blacksmiths, fitters and turners working there.

Their most extraordinary achievement was construction of the 28 ton siphon pipes and 400 ton anchor blocks to hold down the siphon at Surrey Hills.

They also built the gantries and railway lines to carry the pipes into position, 15 ton electrically operated vertical lift gates and other major structures.

It is said that during World War II a hole was excavated at The Birches to store 750,000 gallons of petrol as a strategic resource and road blocks were made for Timaru's Caroline Bay in case of enemy invasion.

No mean feat for dragline to lift 28 ton pipes.

Big generator for Highbank

The biggest single generating unit in the Southern Hemisphere at the time was installed at Highbank Power Station to generate 25,000 kW of power.

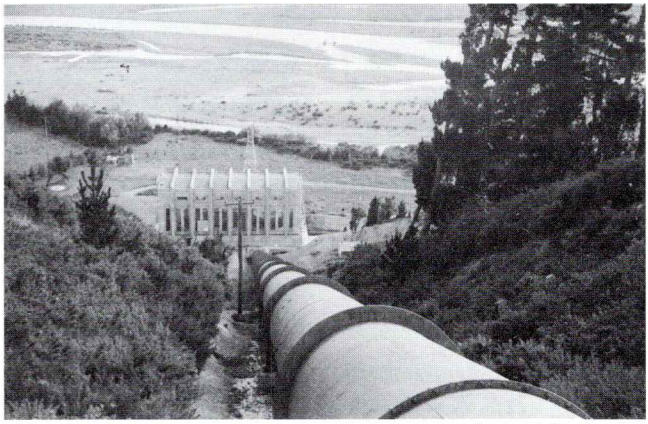
Today a single turbine drives a 25.2 MW electrical generator to make a valuable contribution to the electricity grid. Its location close to Christchurch makes it an important strategic resource.

An additional small auxiliary turbine drives an 80 kW generator which supplies electricity for local consumption at Highbank.

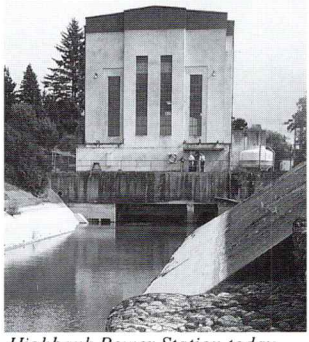
Over the last two years the station has generated about 106 GWh of electricity annually, not up to full potential, because of growing demand for irrigation water.

Highbank operates continuously during winter, from May to September inclusive, at full load as long as there is water in the race. Its generation during June, July and August is of critical importance during winter when electricity demand is at a peak.

During the irrigation season from September to April, it operates only irregularly, according to demand for water for irrigation.



After 42 miles across country the race's big drop to Highbank Station.



Highbank Power Station today.

The station is located on the berm of the Rakaia River. The forebay and penstock are located 104 metres above the power station.

Although not part of the original irrigation scheme, it was included when the potential to generate power during the winter months, when irrigation was not needed, was realised.

On January 21 1938 the Minister of Finance approved expenditure from the Electric Supply Account of $224,300, the estimated marginal cost of additional works specifically for power supply only. It included the South Ashburton siphon/weir and it is presumed, extending the raceway by 13.2 kms.

By the time of completion and the first generation of power on June 8 1945, costs had risen to $578,142, partly because of interruptions because of World War II and enlarging the race.

The power house's 1.6 km ponding section, forming the forebay and penstock, was built of reinforced concrete and steel-plate pipes, nine feet in diameter in the lower section and 11 feet in the upper portion.

Spillways control water flow

The cross-section of Highbank Power Station's forebay was enlarged to 7.6 metre bottom width, with flatter batter slopes and a berm on each batter slope.

No provision was made for flow by-passes except through the penstock and turbine. However, if the Highbank control gate is closed when the race is running full, a side spillway, 17 km upstream overflows into the north branch of the Ashburton River, and another spillway gate, 37 km upstream can be used to discharge into the South Ashburton River.

The spillway and check-gates control upstream water levels for the intake to Ashburton-Lyndhurst scheme, downstream discharge to Highbank and a second control gate for Highbank Power Station.

The race channel to Highbank was designed for a nominal flow of 28.5 cubic metres per second with 600 mm canal freeboard.

Power is passed along transmission lines across the river to join the main line at Hororata Substation.

Since power was first generated at Highbank, the quantity and abrasive nature of Rangitata River sediment deposited in the race and transported through the turbine has been a major operational and maintenance problem.

RDR Manager John Young inspects sandtrap maintenance at shutdown.

Rangitata River sends a high sediment load all along the course of the race, accumulating in places where water is relatively quiescent, like Montalto Power Station, above the Ashburton-Lyndhurst check-gates and in the Highbank headpond.

The accumulation of coarse sediment reduced Highbank's generating capacity and caused severe wear to turbine seals and other station equipment.

By 1976 sediment had reduced the race's capacity to such an extent that the continuous peak output from Highbank was reduced to 15.1 MW.

Over the next two years, large quantities of sediment were excavated from the race reach and peak output restored to about 23MW.

In 1978-79 a sandtrap was constructed downstream from the Rangitata intake to provide a more permanent solution. Since then NZED has paid for sediment extraction during Highbank's summer shutdowns.

No formal agreements covering the conditions of supply, operation and water charges for Highbank Power Station have ever been found within the Ministry of Works and Development.

This is not regarded as altogether surprising because HIghbank began operating under the control of the State Hydro Branch, part of the Public Works. In 1946 State Hydro Electricity Department, later ECNZ, took over.

Salmon swim into history

Highbank Power Station was the scene of a thriving commercial salmon market in the 1950s and the focus of intense angler opposition, with protest demonstrations and barbed wire placed in the tailrace, to hinder the operations.

It all stemmed from the government's desire to establish commercial salmon fishing in New Zealand.

Mid Canterbury rivers are famous for their fishing, particularly salmon and trout. Inevitably some enter the Rangitata Diversion Race and Highbank Power Station tailrace.

A 1986 report by Scarf and Waugh suggested 20% of Rangitata's juvenile salmon enter the race "but their path from here is not clear."

R.M.McDowall says in the 1990 revised edition of New Zealand Freshwater Fishes, A Natural History and Guide, that it was known that in some years substantial numbers of migrating salmon would run into the tailrace of the Highbank Power Station on the Rakaia River.

Quinnat and sockeye salmon were introduced early in the 20th century for the purpose of establishing commercial runs. They were released initially into the Waitaki River.

Saving the salmon at Highbank Power Station tailrace.

Sockeye salmon did not establish successfully but the quinnat salmon spread through the sea to other rivers along the South Island's east coast and continued to return to the rivers.

By 1916 the fish were regarded as sufficiently well established to be caught and marketed, by net fishing in the sea at river mouths and anglers fishing for them in Waitaki and Rangitata Rivers.

Their capture for sale was legalised and continued for 30 years.

However, construction of the first dam on the Waitaki River in 1935-36 reduced the run abruptly.

Salmon numbers dwindled and in 1952 commercial capture of salmon in the rivers was stopped by the cancellation of netting licences.

McDowall says that the government wished to see a continued supply of salmon to public fish markets.

"An agreement was struck between the government and acclimatisation societies that salmon would be harvested from the tailrace each year as it was recognised that these fish did not reach the spawning grounds and so were just wasted.

"The agreement was that at least 750 salmon would be marketed from Highbank each year; catch reached over 3000 in 1956."

However, intense angler opposition to the taking of these fish also developed, culminating in protest demonstrations at Highbank and the placement of barbed wire in the tailrace to hinder netting operations.

Search on to solve problem

"Eventually, changes in the management strategy of the power station led to fewer salmon actually entering the tailrace and the capture of Highbank salmon for sale ceased in 1959," he said.

In later years some fish were taken to obtain ova for salmon farmers. In 1986 there were so many fish in the tailrace that they were salvaged and released back into the Rakaia River.

In 1996 rescue operations were mounted to recover spawning salmon which became trapped in the race when they were heading for their breeding grounds up the headwaters of Rangitata and Ashburton Rivers.

From out at sea the salmon had been mistakenly drawn to the Highbank Station by the scent of Rangitata and Ashburton water unseasonably mixed with Rakaia River water during summer power generation.

The power station had been put into operation earlier than usual because high summer rainfalls had reduced the demand for race water for irrigation.

A working party of interested business and recreational groups is examining ways of preventing it happening again, perhaps by using screens or barriers.

Some salmon enter the race through irrigation scheme waste races. In recent years this has been resolved by installing barriers at the outfalls to the rivers.

Some salmon enter the race through Rangitata and South Ashburton intakes.

Proposals to solve the problem have been discussed over 50 years with no agreement on a number of key aspects, including costs.

The available options discussed range from excluding fish altogether to developing a fishery in the race.

One option is using fish screens to prevent fish of 35mms to 42mms long from entering the race. These include rotary, flat or louvre screens. Costs in 1986 were estimated at from $4000,000 to $1.5 million.

Rangitata Diversion Race manager John Young says while rotary screens have proved successful for small irrigation off-takes and rivers with low flow rates, international research shows they do not work well with larger flows and they incur high maintenance costs.

Gala for shutdown

The big shutdown of the Rangitata Diversion Race every three years for extraordinary maintenance has become a gala day of reunions and memories for many associated with the scheme.

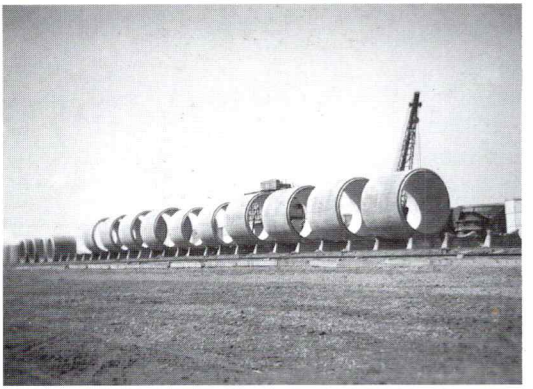
On occasions when the race and power stations have been opened to visitors, many people have travelled long distances to walk through the mighty Surrey Hills siphons and check out the power stations.

The shutdown is timed to coincide with the changeover from irrigation to power supply at the end of summer.

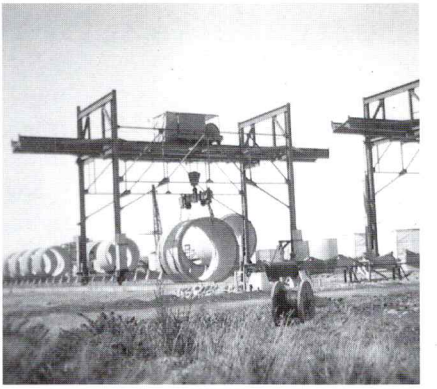
Every six years, the race and Highbank installation are inspected by the national Surveillance and Evaluation of Existing Dams team, to ensure safety standards are maintained and improved.

Highbank is shut down for maintenance for three or four hours each month and annually in January or February.

The biggest, most costly maintenance problem for the race and power station is removing sediment, despite intake sandtraps and floating booms upstream to collect debris.

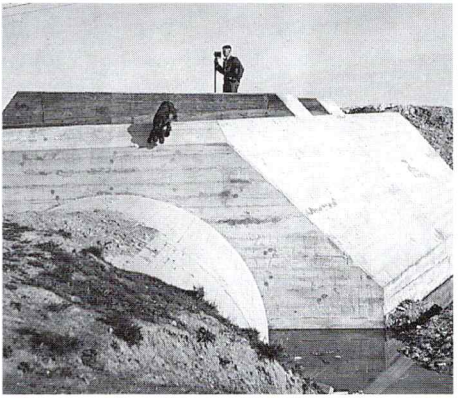


Pipes lined up ready for Surrey Hills siphon.

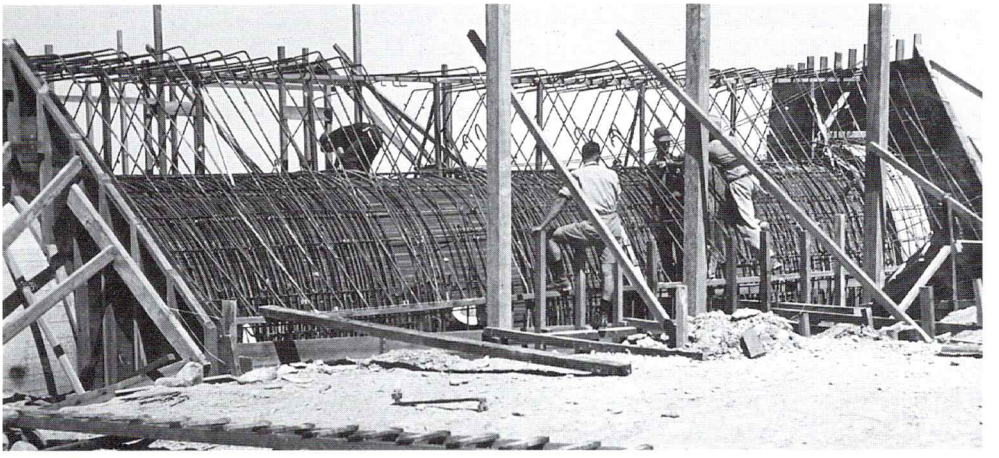


Gantry at pipe factory.

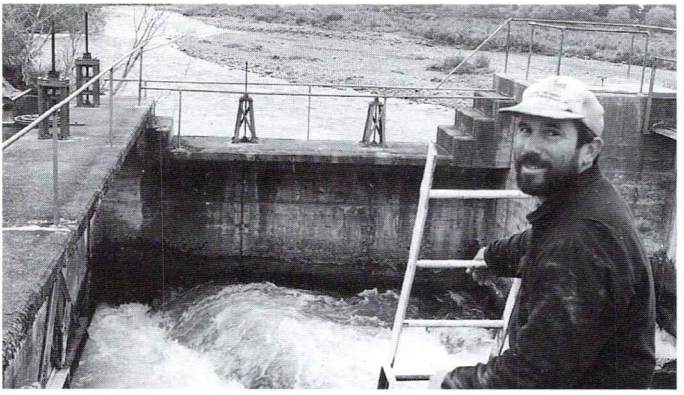
Gantry moves on railway lines to lay pipes.



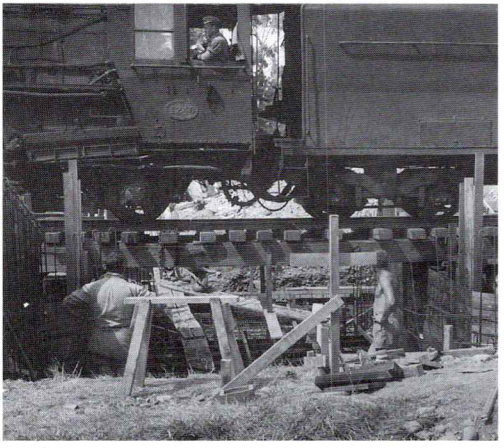
The 400 ton anchor block holds down siphon.



No wonder the anchor block is so strong. Look at size of reinforcing to hold down the big Surrey Hills siphon.



Raceman Neill Stevens checks siphon at south branch of Ashburton River



Dramatic construction of railway culvert at Ealing 1957.

Border dyking at Mayfield-Hinds 1955.

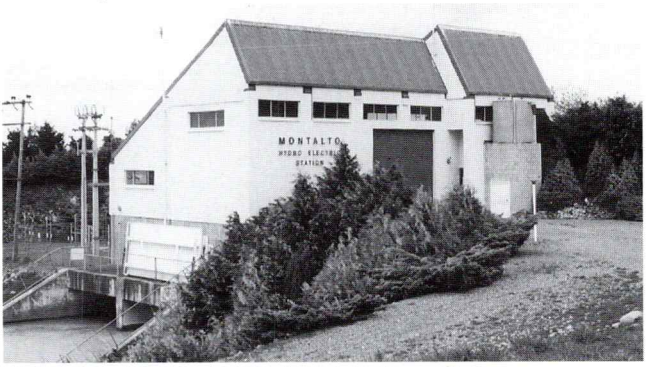
Sloper lateral at work at Ashburton-Lyndhurst 1957.

Valetta control weir in RDR 1956.

Environmentally friendly Montalto

Water from the Rangitata Diversion Race drops down seven metres to feed the fully-automated Montalto Hydro-Electric Station above Coskeries Road in Montalto, 6.8 kms from the Rangitata Gorge intake.

The seven metre fall represents an original three-drop structure built in the race.



Fully automated, remote control Montalto Power Station.

The environmentally friendly station was built on the race allowing water to flow through the turbine or bypass the station through a spillway, without requiring water storage or impeding the race's flow from Klondyke to Highbank.

Built in 1982, at a cost of $4.5 million, it generates about 5% of Electricity Ashburton energy requirements.

Its output during the irrigation season is 1100 kW and at other times 1800 kW, for total energy generation of 1.7 MW a year.

Its Finnish Horizontal Kaplan tube turbine has a speed of 159 revs per minute with a maximum rated water flow of 31 cubic metres per second.

Water flow through the turbine is controlled by adjusting the opening of hydraulically actuated guide vanes.

The pitch of the Kaplan runner blades is automatically altered to achieve optimum efficiency at varying water flows.

The turbine and generator are coupled together through a gearbox in order to increase the speed of revolution for the generator.

Generation at a voltage of 3,300 volts can be stepped up to 33,000 volts through a transformer in the sub-station next to the power house to be fed into the company's 33,000 volt transmission network.

Operating without staff, the station has a programmable logic controller which provides a start-up and shut-down sequence, monitors operations and balances water flow through the turbine with head-race levels.

A remote supervisory control system allows the station's performance to be monitored at the company's Ashburton control centre, providing warnings of alarm conditions and checking various parameters, like power output from the generator.

Electricity Ashburton staff make regular visits to check systems and for maintenance work.

If the station is shut down for any reason, water is diverted through the spillway by the automatic opening of a counter-weighted radial gate.

A formal agreement for use of the Rangitata Diversion Race to 2001 was signed between the Electricity Ashburton and the Ministry of Works and Development in July 1980.

Takes big flood to hurt Race

It took the largest Rangitata River flood this century to threaten Rangitata Diversion Race intake structures at Klondyke.

Three consecutive floods on December 2 and 3 1979, December 25, 1979 and January 27 1980 caused heavy damage to the intake structures at Klondyke and Cracroft and eroded banks in the area.

The December 2 and 3 flood was the largest recorded in the river this century.

It occurred as a result of very heavy rainfall in the head of the catchment at Erewhon where 128mm of rain fell in 24 hours producing a peak flood flow of about 3,000 cubic metres per second.

Flood waters lapped over the Race embankments. Flow records are missing because of recorder malfunction but the peak has been quoted as 3,440 cubic metres per second.

The second flood, on December 25, recorded a peak flow of 2,000 cubic metres per second and the third on January 27 1980 at 1,000 cubic metres per second, following 30mm of rain in 24 hours at Mesopotamia.

Extensive protection at South Hinds River to protect from floods.

The third undermined State Highway one and railways and eroded banks and protective works along the river.

The next largest flood since then, on January 9 1994, with a peak of 2,964 cubic metres per second, rose to 0.1m below the concrete catwalk of the intake pier.

The first recorded large flood was in 1868 when rainfall at Mt Peel was said to have been 203mm in 24 hours and the discharge at Arundel about 88,000 cusecs or 2,500 cubic metres per second.

Major floods have been recorded in May 1876, September 1878, November 1886, 1899, March 1913 and February 1925.

As work was about to start on the Race, a flood on October 10 1936 peaked at 45,000 cusecs or 1,270 cubic metres per second at the intake.

Other floods occurred on April 2 1937, April 20 and 21 1938, November 30 1939, February 29 1940, May 7-9 1940, June 10 1941, April 5 1942, October 23-24 1942, December 16 1943, February 9 1944, January 1945, December 5 1945, September 15 1946, September 23-24 1946, December 1947, September 27 1948, November 2-3 1948, February 1949, January 11 1950, May 25-26 1950 and July 24 1950.

Heavy rainfall on April 17 and 18 1951 caused serious damage, particularly to Highbank Power Station when the race was breached.

Highlights of Rangitata Diversion Race Construction

1936	Decision to build the Rangitata Diversion Race
1937	Construction began on April 2 continued to 1945
1938	January 21, funds approved for electrical supply
1939	Siphon built under the Hinds River
	Slips at Surrey Hills threaten project
	Construction of Surrey Hills siphons starts
	Bay City draglines, 3733, 3744, imported
	September 28, Highbank Power Station approved
1940	Two-thirds of race excavation work completed
1940	October 10, Works Minister Bob Semple lays first pipe at Surrey Hills
1941	May, South Ashburton siphon dug out
1945	June 8, Highbank Power Station generates power
1978	Installation of intake sandtraps begins
	August, Decision to build Montalto Power Station
1981	January, Construction begins
1982	June, Montalto Power Station generates power

Floods break out race bank

Rainfall of 195mm fell at Erewhon, made famous by Samuel Butler and his book, Erewhon, in April 1951 causing a peak discharge of 1,250 cubic metres per second.

Other floods followed on November 29 1951, January 1952, February 2 1952, December 1953, January 1954, February 2 1954, February 1955, January 30 1956, April 24 1956, November 1956, November 1957 and December 22 1957.

Five days later, on December 27 1957, the biggest flood since 1868 and since European settlement caused major damage to river works, races, stock, pastures, crops, roads and railways. Peak discharge at the intake was 3,480 cubic metres per second.

This was followed by further freshes and floods in January 22 and February 22 1958 with discharges up to 1,300 cubic metres per second.

Annual floods are recorded from 1960 to 1978 until the three major ones in December 1979 and January 1980.

Annual floods occurred from then until the large one on January 9 1994 almost reached the top of the intake pier structure at Klondyke.

On December 13 1995 the Rangitata peaked at 2,190 cubic metres per second and broke out of the right bank above the protection works near Arundel.

A further fresh, on December 29 and 30 in 1995, of about 1000 cubic metres per second, washed out railway embankments and damaged State Highway One.

Families come up trumps coping with camp life

Men and women moved into primitive camps in Mid Canterbury during the 1930s and 1940s "for the job."

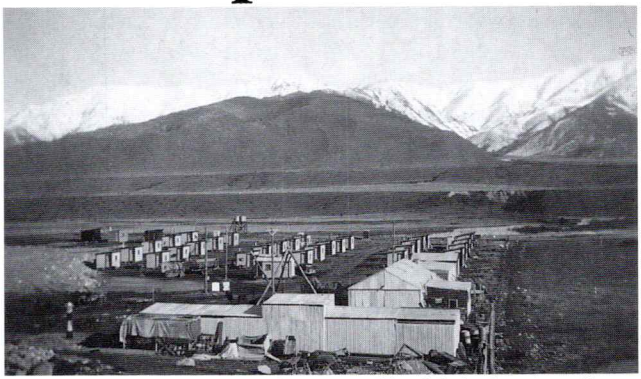
That job was the vast Rangitata Diversion Scheme to irrigate Mid Canterbury plains and provide work for the unemployed during the 1930s depression.

At the same time, development of new mechanical equipment, like combine harvesters, had replaced threshing mills and other labour-intensive businesses which had provided work in agricultural industries.

Most of the men who went to work on the Race had been on unemployment schemes, single men paid 10 shillings a week by the Unemployment Board, married men according to their family size, for relief work, mainly in local body schemes like roading or clearing trees.

Food parcels, like flaps of mutton in sugar bags, were handed out to needy families.

Men who were offered the chance of full-time work on the Race grabbed the opportunity.



Where it all began. Public Works camp at Klondyke by Rangitata Gorge.

At first they lived in Public Works single men's quarters, little eight by 10 foot huts heated by a coal stove at Klondyke, at the race intake by Rangitata Gorge.

Later camps were built for married couples and their wives and families joined them. Any doubts or fears they had of moving into government-controlled living quarters in the outbacks were overcome by their desire to live together as a family and have a regular income.

At the peak of construction 300 to 400 men worked on the scheme. They were housed in six camps, single men's huts at Klondyke and The Birches, No 1 The Birches, a camp with slightly better accommodation for engineers and overseers, married quarters for couples without children at The Birches, called "Dry Bones," and Anama and Montalto.

Camp houses were built of wood three quarters of the way up the walls and the rest was canvas, lined with black malthoid, a thick tarred waterproof paper.

Most had three rooms and electricity but there was no hot water and they shared a wash house, with bath, copper and basin for washing clothes, with their neighbour.

However, families were again to be separated when World War II broke out in 1939 and many men left the job to go into service for their country.

Facing hardship with smile and boiling copper

During the war wives and children remained behind in the isolated back country.

Despite all the adversities, many of the women who lived in Public Works camps look back on those years with fond memories.

They were all in the same boat, they say. No-one had any money. Best of all they were young, they could cope.

"I can't say it was a distressing life," says Glenys Hopkinson, who, at 23 years of age, moved to the Montalto camp in July 1938 to set up home with her husband Bill, a dragline driver at Klondyke and bring up her family there.

"Everyone was in the same boat. There was no-one there with a lot of money. They were there just for the job. It was a necessity for everyone," she said.

"The lovely part about it for all those women was there was no such thing as running down to the dairy. You had to do your own cooking and baking. There were no sweets and things.

"You did not get out. Only once a week we went to the shops in Mayfield. It is not like living in town. I think it matured you a lot quicker."

People just cooked and baked. The grocer, George Meikle from Mayfield, came around twice a week. He took orders on Monday and delivered them on Thursday.

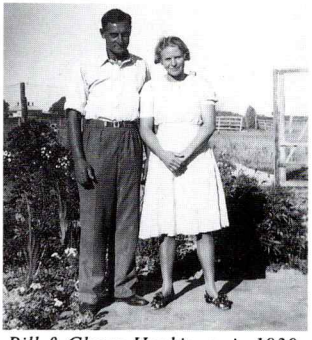
"The butcher, Laurie King, came once a week and that was the only time you saw anyone.

"If you wanted a doctor you had to go to Ashburton, that was 29 miles. It was seldom people used them. When you think back it was amazing."

She says there was a lot of competition among the women over baking and reckons no-one could match her skills at making flakey pastry.

She could make it with 12 layers.

And, in those more formal days, they were all known as Mrs, only on first name terms with very close friends. But it was a friendly atmosphere.



Bill & Glenys Hopkinson in 1930s

"Camp houses were not the warmest but in those days it was the cheapest job you could have for a home. There was coal range and open fire.

"You could cook dinner and the kids could sit around the open fire, so you did not have to depend on the coal range to keep you warm.

"It was so cold in winter Bill would take the axe and go down and cut a hole through the ice on the race so we could get water.

"When you think on it it was not an easy life but it never did anyone any harm."

She kept the copper boiling. With five young children, the days were long and busy, getting up at 5am to feed the baby, light the copper and soak the whites.

All the clothes were boiled and the children wore clean clothes every day.

Waking to ice, frost indoors

On rare occasions when men were on the same shifts, their wives would go to the pictures, an old corrugated shed in Mayfield.

Mrs Hopkinson recalls when the Labour government brought in the family benefit, shortly after her children were born, and made it free to go to maternity homes.

As World War II loomed, petrol was rationed, along with butter and sugar and many men went off to war.

She did not have a driver's licence when her husband went away to the war. But she drove everywhere anyway in a car her brother left for her when he went to war.

"It was lonely time when Bill went to war. But I received his wages and had no rent to pay."

She enjoyed adult company when Rona Norman, now Mrs Gower, the sole charge teacher at Montalto School just over the fence, would call in for a chat and afternoon tea after school.

Vera Crowley says they were lucky they had their own wash house but there was no hot water when she lived at The Birches.

Her husband Mick Crowley was one of the youngest bulldozer drivers when he started excavating the Race at Klondyke in March 1937 at the age of 18.

Sub-zero temperatures all part of camp life.

He once described the harsh conditions, working on a cabless bulldozer on night shifts, from midnight to 8.30am, in temperatures well below zero as "really cold. It was called Klondyke after that place in Alaska - it was that cold."

They worked 42.5 hours a week for four pounds 19 shillings, regarded as good wages in those days.

Later when he worked on the Surrey Hills section he lived in a tent because of a shortage of wooden huts.

"The Race is a wonderful thing," she said. "The men really worked so hard. They never had the equipment like they have today.

"And now, if it rains, men knock off. They didn't. They worked through hail and snow. It was a terribly cold.

"They worked all the hours the Good Lord gave them on different shifts. They were all good men and they all got on well."

Living conditions were fairly primitive, says Alice Scott, who lived at the Birches for eight years from May 1941 when her husband Hughie was a blacksmith on the scheme.

"They were little three room houses, actually huts bolted together, a kitchen with a little black iron stove in the middle and a bedroom on each end."

With more than three children they were entitled to an extra bedroom, built out from the back porch.

Sharing washhouse is worst

"When we unexpectedly had twins they had to give us another bedroom so we ended up with four bedrooms," said Alice Scott.

That was in 1943 and another two sets of twins were born within six weeks.

"It was strange. They all said they didn't know whether it was something in the milk.

"And you know, in the winter, they used to put that black paper on the walls and you could see the ice and frost on the black paper in the mornings.

"We had only one little window so we asked the engineer if we could have another window to let the sun and air into the house."

She said they had been moved to the Rangitata Diversion Race because it was seen as essential war work.

She recalls the Surrey Hills pipes which were so huge a car could drive through them and the tough conditions for the men working there and the bitterly cold winters.

Life was never lonely because there were people on both sides.

"The hardest part was sharing a washhouse.

"The lady next door to me had six children. You had to have certain days that you could use wash house and they had the other days. There were no showers, only tin baths on legs and you had to boil up the copper and heat all the water.

"It was tough in the winter. I did not always bath the children in the washhouse. I did them down in front of the stove in a small tin bath.

"If they were bathed out in the wash house my husband had to wrap a rug around them to carry them back in out of the cold. It was primitive that way.

"You had to be tolerant. You could not take the other family's wash day or bath night unless you said you had extra washing and asked to use the wash house.

"Looking back, I say sometimes to my family, we managed it because we were young. Also we had to have a job. Those days there was no family benefit or anything, no government help, not like today.

"I can remember when the family benefit first started, half a crown for each child. It was very low."

There was no entertainment for kids so they all just played together and seemed to get on well together.

Children had to walk quite a distance from The Birches to Anama. On wet days the Ministry of Public Works sent a truck with a canopy on it to take them to school.

"The Nell's bus from Mt Somers used to go past every day and if you wanted to go to town you caught the bus early in the morning at 8am and then you did not get home until 5pm at night.

"I remember taking the twins for injections when they were a year old and manhandling them into the pram. The bus driver put the pram on the bus and said: "You have more than bloomin twins in this pram. I can hardly lift it."

She says the pram was full of everything because they had to stay in town all day.

"When you look back I suppose everybody seemed healthy and well.

"Given the same circumstances, and if I was young, I would do it all again."

Celebrating 100th 12ft pipe

Dubbed "The Pipe Factory Gang" they celebrate the 100th mighty 12ft diameter pipe for Surrey Hills siphon.

Pretty rough but friendly

Life at Anama camp was ''pretty rough'' but it was friendly, says Lil Waterreus.

Her husband Len was a steelbender on the scheme bending steel for Surrey Hill pipes. Her son Len surveyed farms for irrigation schemes.

Despite the conditions, outside toilets, shared wash house and no hot water, "We made our own fun and went to dances at Mt Somers.''

The Public Works built social halls at Anama and The Birches. And a great time was had by all, dancing, singing, playing guitars, banjos and mouth organs.

Single men's camp, on left, at the pipe factory.

All good mates farewell Bill Hopkinson off to the war. From left, Ron Davie, Jum Broker, Jim Weir, Bill Hopkinson and Jimmy Prendergast.

Dramatic rise in school rolls

The influx of children from Public Works camps taxed space at Anama, where the roll doubled, and at other schools in Mid Canterbury while the Race was being built.

Rona Norman had grown up in Christchurch and had never been in the country when, aged 21, she was appointed sole charge teacher at Montalto School in 1942.

"It was a real culture shock. After I was appointed I had to find out where Montalto was," she said.

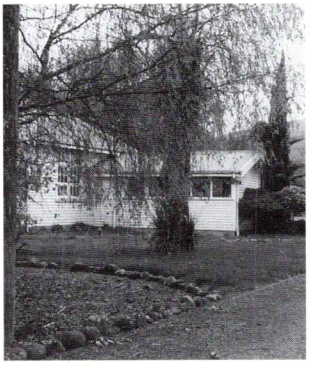
"In those days war time coloured everything. Transport was very difficult and it was very isolated.

"I was really dropped into it. I think I was fortunate I did not strike problems. The children were very good and easily managed."

Her pupils, however, remember her as a combination of a strict disciplinarian and a friendly personality who gave them piano and singing lessons after school.

She says the men went off to work on the Race but no-one else really knew much about it. The families in the area were "wonderful people" and many invited her to visit them.

Because of the isolation, lack of transport and petrol rationing, pupils could not join in outside activities but they went for picnics up the hill and swimming in the river.



Formerly Montalto School.

Montalto School was one of the few "open air schools" in Canterbury and she said conditions were so cold, particularly in the big snow of 1945.

Apart from an annual inspection visit by the Education Board she was on her own. The school committee did not encourage input, she said, and monthly meetings were more of "a farming chat."

She did manage to get ground next to the school to make a school garden and the committee fenced it off to keep out rabbits.

The school roll rose to 30 when the Montalto camp was built next door but dropped to 14 by 1942 as families moved out and down to seven in 1945.

Anama School was bigger with 26 pupils in 1936, a number which almost doubled when the Race started.

Children from camps at Anama and The Birches attended, as well as those from farming families.

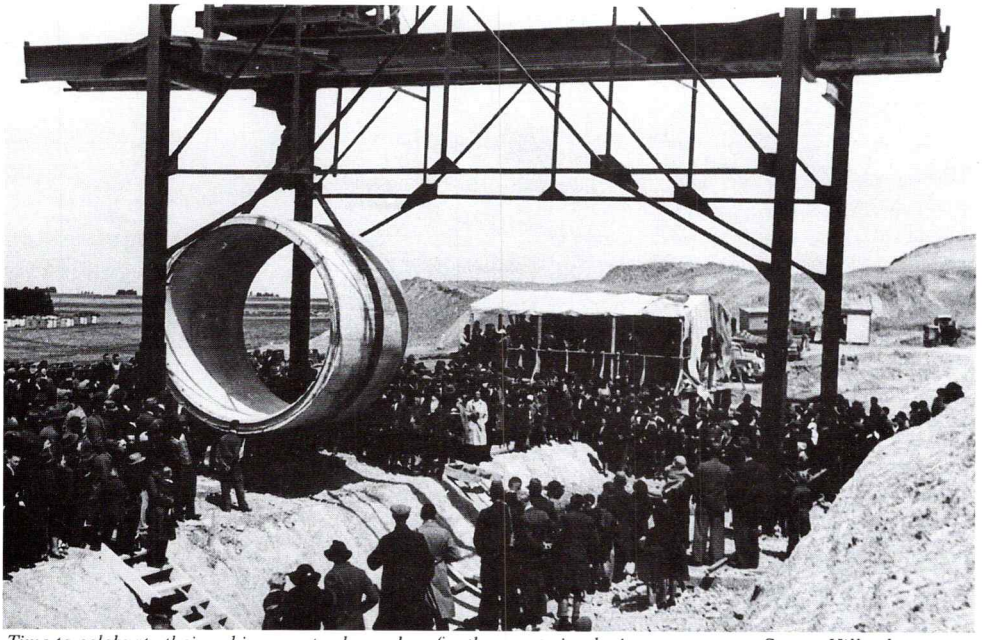
"Accommodation in the school was taxed to the limit with children from the P.W.D camp," says a 1938 report in Anama 75th Jubilee booklet of 1977.

And despite petrol rationing, the children were taken to inter school sports and other outside projects.

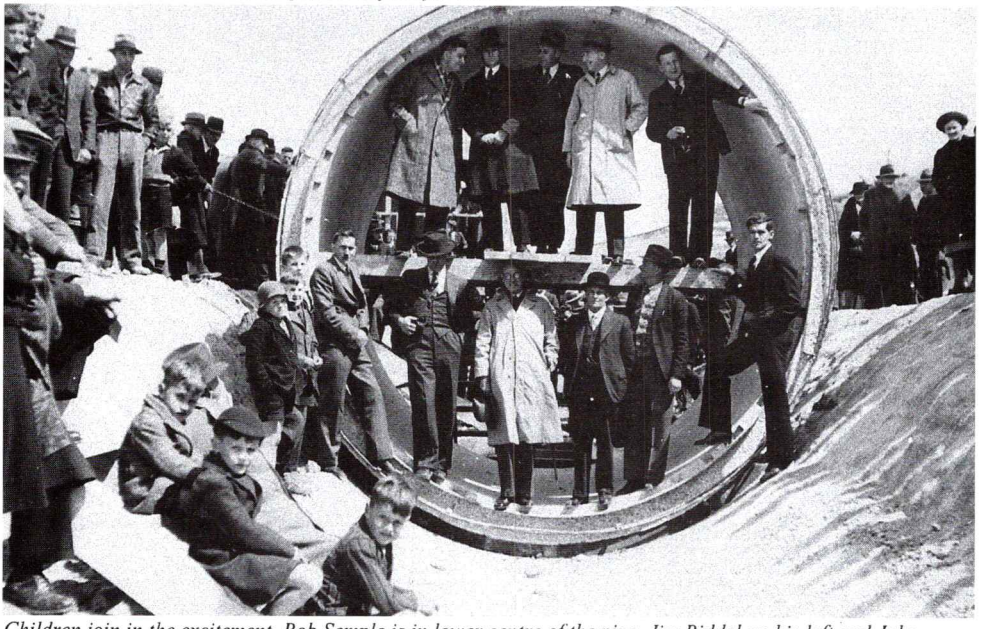
The Public Works Department built a new primer room and an infant mistress was employed to join the sole charge teacher Miss A. M. Ferguson.

A dental clinic was opened in Mayfield on April 10 1940. Milk and apples were provided daily by the Education Board and delivered by the mailman.

Anama School roll dropped to 28 in 1945 as the pipeline was almost finished and families moved away.



Time to celebrate their achievements, dressed up for the great pipe-laying ceremony at Surrey Hills, the people gather. Some saved their petrol coupons for months to be sure to be there.



Children join in the excitement. Bob Semple is in lower centre of the pipe, Jim Riddel on his left and John De Lambert, extreme right. Top from left, T G Beck, Fred Langbein and Ted Smith on extreme right.

T. G. Beck brains behind it

T.G. Beck was the brains behind it all, says Michael Burns, who started work on the race in 1948 when he was 15 and returned agina in the mid 70s, in charge of operations and maintenance.

His father Chris had earlier been overseer of the race at Winchmore.

He says when the Surrey Hill slips occurred and open races were no longer viable, T.G. Beck would just ring up Bob Semple and tell him what was going to happen.

Growing up at Springburn, he says there was huge interest in all the machines working around the clock, trucks going up and down.

"There was something special about it and that it started off from the Depression when a lot of people were out of work. A lot of Temuka people who worked on the race travelled to work every Sunday night.

"It is an asset," he said. "I don't think it gets the credit due to it. It is a terrific boon to the economy of Mid Canterbury.

"It is also a very high standard of engineering. It has run for 50 years without problems, worked perfectly and had dedicated racemen always on duty."

If it hadn't been for Bob Semple there would not be irrigation in Mid Canterbury, says Des Laurence.

"Bob Semple was a great man. He had the drive to get it all going and get everyone working.

"There was something special about it and that it started off from the Depression when a lot of people were out of work."

"A lot of farmers were anti irrigation. But not many are today."

He worked on the race in the late 1940s cleaning out silt and shingle from the siphons to stop them scouring the pipe joints.

"We had spirit lamps and we mixed all the concrete inside the pipes," he said.

Later he drove graders at Winchmore and Mayfield-Hinds schemes, became foreman of plant operations and supervisor after Chris Burns retired.

Trevor Bush was also involved with surveying farms for the irrigation scheme when he joined as a surveyor and engineering officer.

He started when the siphons were being constructed under the rivers. After three years away in the army, he returned in 1946 to planning the Winchmore irrigation scheme and discussing the options with farmers.

If the farmers agreed to join in, grader crews were sent in to prepare the paddocks and structures were built to connect them up to the head race.

Water was supplied to the highest point on the farm and meters installed.

"I knew the farmers on all the local schemes, the structures, dams and headgates," he said.

"In the early days farmers were fairly marginalised. Some were quite anti, some very keen.

"As the years went by, they looked over their neighbour's fence and saw what they had and wanted it. But by then costs had risen. Their attitude now is generally quite keen.

"The impact of the scheme has brought benefits to the town from a revenue point of view and benefits to farmers and the countryside," he said.

Pioneers face new challenge

Two of the first and best-known machine drivers on the race, lifelong friends Mick Crowley and Bill Hopkinson both came from families with extensive mechanical know-how.

Both their fathers had threshing mills with traction engines, British John Fowler engines, which travelled around Canterbury threshing crops for farmers. Hopkinson's mill was at Temuka and Crowley's at Otaio.

Their fathers had taught them how to drive and maintain the traction engines.

However, the days of the mills were coming to an end in the mid 1930s as the technology of combine harvesters took over.

Both were out of work and grabbed the chance when the race was started.

They assembled and drove the first bulldozers and draglines imported for the tough work of clearing boulders from the Rangitata Gorge to build the race at Klondyke and the Surrey Hills race for the siphon.

The challenges were enormous - tough terrain, huge boulders, freezing cold weather, assembling imported equipment like the Bay City draglines, day or night shifts. The risks to life and limb were great, particularly working under a few lights at night.

There were no support services for miles to meet any emergencies in that remote countryside.

It was a measure of the humour they brought to the job they dubbed Klondyke, lit up by lights at night in sub zero temperatures as "Fairyland."

''Mick and I were very close friends. We grew up from similar backgrounds, and our fathers were great friends as well,'' said Bill Hopkinson.

''Handling the new equipment at the race was just natural to us because we grew up with traction engines.

"Mick was probably the best bulldozer driver down there on the job.

''I cannot speak too highly of the men who worked on that scheme.

"I always felt there were no better men in the whole world. We had to find our feet under very harsh conditions."

He says the irrigation scheme has had a huge impact and is proud of the achievement.

''Built by New Zealanders for New Zealanders. You might say our job was a complete success.

"It has been there for 50 years and it might be there for another 500 years. I don't think it will give any trouble.''

He started at Klondyke in September 1937 and worked on the race from Klondyke through Montalto, Surrey Hills to Mt Somers.

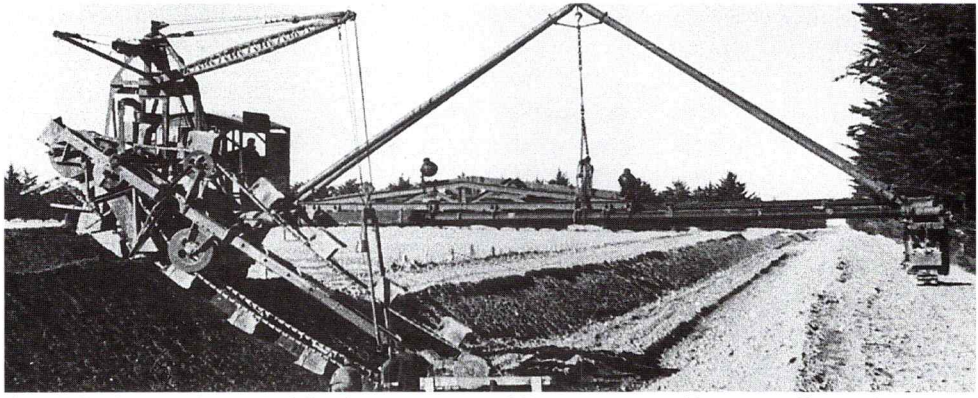
He recalls he was driving the Bay City dragline 3733 in the North Hinds River near Mt Somers, loading shingle on to trucks for building the Surrey Hills siphon, when Japan bombed Pearl Harbour in November 1940.

He enlisted and went to Fiji to help enlarge Nandi Airport for the American build-up to defend the Pacific.

He was astounded to see the Bay City 3733 arrive in Fiji by barge to do the job.

"Put me on that one," he said. "That's mine."

A machine spells perfection



Superb finishing machine, a Ruth Dredger, excavating a 360 cusec race at Ashburton-Lyndhurst scheme.

The reason why the Rangitata Diversion Race is so perfect and still functioning today almost as well as when it was built more than 60 years ago is due, in large part, to the accuracy of the finishing machine, says Bill Hopkinson.

''It was a fantastic machine for those times. I still marvel at it.''

The machine, an elevating grader, shaped the big channels so accurately, to the correct depth at the bottom, correct level and fall and the banks were perfectly cut at 45 degree angle.

He dug the formation for the race at the Klondyke intake and along to the siphons at Surrey Hills and under the South Ashburton River.

He says the ground was almost hard as concrete.

''It was an awful job. And so was the race at Klondyke through to the headworks. It was all hard as concrete and with big boulders. It was difficult country and we were all new to that machinery but we soon found our way."

As for the weather: ''You have no idea how bad the climate was. I think the coldest night of my life was spent on a bulldozer in the south branch of the Ashburton River.

''Down those New Zealand rivers, all of them, from the Southern Alps with snow up there, the wind blows down those gorges, all night, every night.

''We used to dress up to go to bed, put on an overcoat and everything we had to get into the blankets. It was the same in the Rangitata River gorge. That was dreadful.

"There was no anti-freeze in those days. If we drained water out of the radiator, the next morning you could not get any water into the radiator because it froze as soon as it touched the sides.

"The big bulldozers held about 20 gallons and if you went on pouring into it, it overflowed frozen. That's how cold it was.

''Most people have no idea of the harsh conditions the men worked through. But our generation has a great attitude - when the going is tough the average Kiwi male would make light of it, make out it is nothing.

"It is the great strength of the New Zealand male. I cannot speak too highly of the men working on the scheme," he said.

Tough time working on race

Two Burgess brothers, Jock and Ken, who was nicknamed Hec, were among the pioneers and innovators who worked on the scheme right from the start.

Jock Burgess worked as a fitter and turner in the workshop at Klondyke for three years until he went into the army in 1940.

''It made Mid Canterbury,'' he said. ''And the power station at the end was an added bonus.''

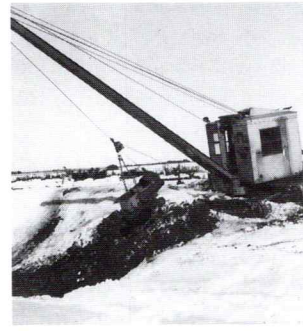
He recalls seeing Public Works Minister Bob Semple three times while he was working there.

''I took the first pipe up to Surrey Hills,'' he said. ''We made up a cradle on one of the athey-wagons which was pulled behind the RD7 bulldozers.''

The attey wagons were usually used for carrying away shingle, boulders and silt excavated out of the rivers. But they were adapted to carry new machinery imported from the United States up to the Klondyke work site.

Bob Thyne was a labourer, pouring concrete for the Surrey Hills pipeline when the lower part of his arm was crushed in a concrete mixer.

''They put in two miles of pipes around Surrey Hills, putting in round bases in the bottom," he said.



Work went on rain, hail or snow.

"We put in one section, missed one and then did the next one, and then came back and filled in the missed one.

''The pipes were 12 feet in diameter, so the sections were 12 feet long. The concrete was laid at least 15 inches thick under the pipes.

''They built big gantries down at Temuka and we assembled them over the ditch so they could put in the pipes.

"On the third of December 1939 I got my arm off. They had three parts of the pipes in then.

''We were putting in the concrete bases. And we would do a hit and then a miss and so on. We were shifting the shoot along to the next one. I usually shut the concrete mixer off but I didn't this time.

''My mate who was on the other end of the shoot said he could not lift the shoot because it was too heavy and let his end go.

"And I slipped and put my hand up and put it in the wrong place, didn't I, into the mixer and it pulled my arm in and crushed it up to within about four inches of my elbow."

His arm was crushed between the bowl and the support of the concrete mixer.

"If I had not pulled it out I would not have an arm at all.

''I was back to work in 90 days. And I have not had trouble whatsoever with it.

"When I came back I went into the fitting shop for about 12 months and then I went to work at the Timaru County Council, doing mining, tunnelling, driving trucks.

"I was there for 32 years. I'm alright in my health, just my legs are getting a bit tired now. So I did not see the finish of the race.

"I think it was a great scheme. It was more or less done by chappies who did not know anything about it. They just took the jobs on.

''Bob Semple was the man. He was the man who got it going,'' he said.

Tragedy strikes workers

Jim Ellery was working near Bob Thyne when his arm was crushed in a concrete mixer.

"I stripped off my shirt and tied up his arm and they put him in the car and took him to Ashburton. From there they sent him on to Christchurch.

"His arm was just hanging by the skin. They just amputated the rest of it. But he never let it get him down."

Jim Ellery was only a 14-year-old Mayfield boy when he started work on the pipeline as an apprentice carpenter and boxed the joints along Montalto, Anama and Ashburton.

He biked seven miles each way to go to the job and was paid 13 shillings and sixpence a week.

"I always wanted to be a carpenter. I don't think anyone could have ever had a better education as a carpenter," he said.

"In fact, by the age of 17, engineer Wally Begbie said I was the youngest foreman he ever had under him."

"We boxed all the joints along Surrey Hills, did a wee bit on the Ashburton River, a terrific undertaking.

"It was wonderful I learnt everything about building huts and houses.

At 18 he went into the army and overseas.

Later he set up his own building company and built the new 24-room Mesopotamia homestead in 1952 near the Rangitata Gorge.

He says work habits developed on the Race earned him a reputation as a builder as Jim "Dawn to Dark" Ellery, as they carted shingle out of river, mixed concrete on the job and did everything by hand.

He says the work on the race was great for the unemployed. "But for the women living in the camps it was terrible but they just had to battle it out.

"When war broke out, the men left and the wives, many miles from home, were left behind."

He says the race brought a lot of business to Mayfield, through functions held there and shop deliveries to the camps.

Two men are known to have been killed on the job during construction of the race.

In 1942 Frank Keane climbed down from the crane he was driving alongside the electrified gantries carrying siphons to Surrey Hills to make some adjustments in the carpentry at the base of the race.

When he went to climb back on to the crane, he was not aware the top of the crane had fouled in the power lines. The crane was alive with electricity and he was electrocuted.

Bill Hopkinson found Jack Keenan's body when he went to work one Monday morning at 6am. Jack Keenan had started earlier, at midnight, to de-water the big centrifugal pipes.

"When I got there, no water had been pumped out and he was lying face down in the water with his thigh gumboots on," he said.

He had to wait there until the next person started their shift at 8am.

"It seemed when Jack had started to prime the pumps, pulling out a U-shaped handle fixed to the big pump, one end of the handle came loose and he fell backward into the water and drowned."

There were no safety rails and no-one else on the job.

Drastic impact on Montalto farmland

The Race literally cut in half Bill Greenslade's 600 acre sheep and cropping farm at Montalto.

"It was quite drastic," he said.

"And later, construction of the Montalto Power Station was drastic as well because they had to take more land."

He says they accept it now but at the time there was machinery tearing in and out of their property leaving gaps in fences causing problems of wandering stock.

The race cut right through their farm and, although bridges were built, it involved moving stock much further, across the bridges, than they had to in the past.

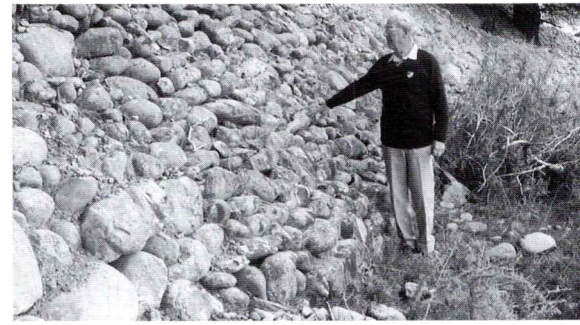
"It was inconvenient and it did not do farmers any good. It was all disadvantage."

Worse still, they could not access water in the race because the rainfall in their area was considered too high for them to qualify.

He says there were problems at the end when they had to fight to get compensation.

But it has all settled down now.

Council carved out race first

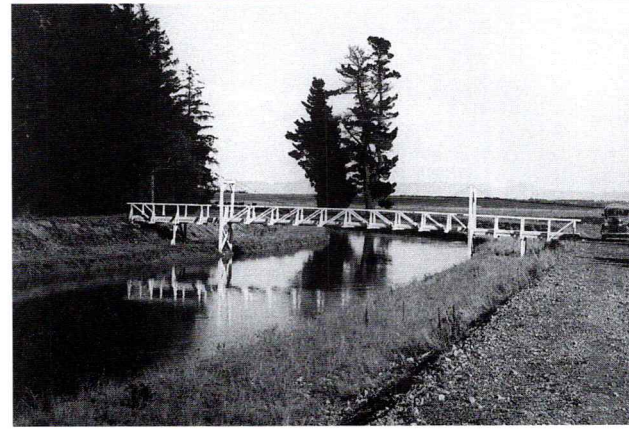


Arnold Rushton inspects remains of earlier race built last century.

Anama farmer and well-known identity Arnold Rushton says Public Works Minister Bob Semple is usually given all the credit and foresight for building the Rangitata Diversion Race to irrigate the Mid Canterbury Plains.

But before the end of the 19th century the Ashburton County Council had started forming a race from the Rangitata Gorge.

The outline of the county race is still there today, starting exactly where the present race begins and running along the same lines around the perimeter of the mountains at the Rangitata Gorge alongside the Rangitata River. Mr Rushton is deputy chairman of the Rangitata Diversion Race Management Company and deputy mayor of Ashburton District Council.



A footbridge to give a farmer access across the race.

Race land safe for farming

Mayfield Romney stud breeder Ron Oakley also saw farmer resistance to the Race.

His father, Raymond Oakley started stud breeding in 1920 and Ron began in 1951, going on to win over 100 ribbons and become president of the Romney Council of New Zealand and an honorary life member.

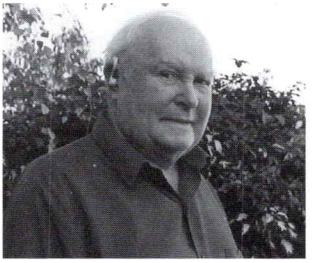
''When irrigation was first proposed I have to say not many farmers were interested, probably because of the cost and also not knowing anything about the outcome.

''I think it was very visionary of the late Bob Semple who started off the scheme, importing the first bulldozers and draglines into New Zealand and moving mountains of earth and rock to make the irrigation race.

''For those who worked on the scheme I have a lot of admiration, especially those who worked on the head race in the winter time.

"When the race was dug around the side of Surrey Hill all the neighbours said the hill would slide in. But the designers still carried on.

However the hill did start to shift so the race was replaced with giant pipes.



Romney stud breeder Ron Oakley

''I happened to be there the day Bob Semple held an open day and Bob's chauffeur drove him through the concrete pipe in his car.

''I still remember on the day of the tour there was applause from the crowd when Bill Hopkinson managed to get a very large boulder into the bucket of his dragline, not many having seen one at work with such an experienced worker.

''I knew all about that because I arrived earlier and Bill had stopped, waiting for them to give the message to go, and he said: ''Hop up with me.

''Then all the cars and officials arrived and I was up there with Bill.

"He was working, but had a big boulder there specially.

"He played around with the boulder and it took him nearly half an hour before he got it in the bucket.

"I wasn't supposed to be up there with him.''

However, he says, the race was finally finished and water drained off for irrigating farms. This started off very quietly but soon there were more farmers wanting it after seeing the results.

About three years later farming changed completely in Mid Canterbury. Irrigation took over, stock could be grazed in time of drought, easing the burden on those unable to get water.

Over the last few years there has been a massive move into dairying in the area with many North Island dairy farmers shifting down and buying land.

''Irrigation at first took a lot of learning, such as when to water and when to graze, especially with stock

''It guaranteed the feed position in Mid Canterbury. Before that came in, it does get very dry here at times and everyone trying to sell stock but there would be no buyers.

"But now, with irrigation, they can buy up and stock up and have grazing if they are short of feed.

''It has made Canterbury a very safe farming area,'' he said.

All New Zealand should know about this great Race

Surrey Hills farmer Frank Greenslade wanted all of New Zealand to know about the Rangitata Diversion Race scheme.

He sang its praises all his life, from the time he was a little boy and watched the Surrey Hills slip drama which occurred right outside his gate.

If the race was not here Ashburton would only be about a quarter of its size, he said.

"Water supply from the race gives farmers a guarantee they are going to grow grass. It is a guaranteed form of drought protection."

His family has farmed the area since 1913 and as a boy he watched the earth-moving machines working 24-hours day and night. They disturbed his homework and his sleep.

At times, the noise would be so bad he had to move deeper into the house to try to escape it so that he could get some sleep.

He went to the Anama School where the roll reached record numbers of about 50 children following the huge influx of workmen and their families who lived at the main camp nearby called The Birches.

Frank and May Greenslade at their farm gate by Surrey Hills siphon.

"Water supply from the race gives farmers a guarantee they are going to grow grass. It is a guaranteed form of drought protection."

Opposite The Birches was the open air factory where the huge pipes were manufactured.

He said the factory also made road blocks for use at Timaru's Caroline Bay in case of invasion during World War II. A reservoir, capable of holding 3.3 million litres of petrol was also built there as a strategic wartime reserve.

One of the most spectacular engineering feats of the whole project, huge siphon pipes, was located right outside his gate.

The high-pressured siphon made from huge steel-reinforced pipes, four meters in diameter, weighing 28 tonnes and holding 276.3 million litres of water, were laid underground, around the base of the Surrey Hills.

Along with the 400 ton anchor block sited almost opposite the family home, the siphon replaced open raceways because of the unstable nature of Surrey Hills country.

As a boy Mr Greenslade attended the laying of the first pipe for the siphon by Public Works Minister Bob Semple on October 19, 1940.

Race critical to region

The Rangitata Diversion Race is the lifeblood of Mid Canterbury and critical to the region, says Rupert Curd, Winchmore farmer and chairman of Canterbury Regional Animal Health Committee.

"It has enabled wide diversification to take place. Otherwise we would be in a desert situation," he said.

Now the issue confronting the region is enhancement, ensuring water is meeting the demands better than ever before.

"We must work hard, not only to protect the flow but enhance it. I am very pleased to see a group working on it," he said.

Early trials, promising six ewes per acre instead of just one, paid off.

Plaque at intake salutes race as important part of engineering history.

1996 Valuation

The cost to construct the RDR today from a "greenfields" site has been estimated as:

	$
Construction cost of all structures (hydraulic structures, bridges and culverts)	30,362,000
Construction cost of race itself (earthworks, lining)	17,750,000
Subtotal	48,112,000
Preliminary and general costs 12% of subtotal	5,773,440
Engineering costs, 10% of subtotal	4,811,200
Feasibility studies and consents, 10% of subtotal	4,811,200
Contingency, 30% of subtotal	14,433,600
Grand total	77,941,440
Say	$78,000,000

Cost estimate does not include other assets like vehicles, houses, maintenance and office equipment, land purchase, fencing or electricity generation facilities at Montalto and Highbank. To re-build the race after a major catastrophe would incur extra costs of demolition and clean up, as well as loss of income while the scheme was not operating.

Race lifts economy $30.6m

Rangitata Diversion Race generates an estimated $137.7 million annually in economic benefits to the Ashburton district, according to Ashburton farm consultant Bob Engelbrecht.

Gross farm income directly attributable to race irrigation is conservatively estimated at $25.6 million, an additional $400 per hectare over 64,000 hectares.

On top of that, an additional $5 million of gross farm income benefits dryland farms in the district, as a source of feed and purchase of livestock.

He says Mid Canterbury gross farm income is about $200 million, an average of $1000 per hectare or $200,000 per farm, though individually it can range from $200 per hectare to $10,000.

As a result, the economic benefits to the Ashburton district, using a multiplier effect of 4.5, shows $30.6 million generates $137.7 million annually, or $5,738 per head of population, based on 24,000 people.

He says irrigated farms are consistently achieving higher gross profit per hectare than non-irrigated ones.

Race generates $137.7 million annually to Ashburton economy.

Irrigation is becoming a necessity and properties without irrigation are becoming less viable.

Farms are likely to be bought on their irrigation potential. Also many farmers with efficient systems are enhancing them with more wells, mainlines, irrigators and border-dyking.

From an analysis of farmers' accounts, he estimates a margin of $259 per hectare for border dyke irrigation above dryland and, for sprinkler irrigation.

The margin is even higher, at $482 per hectare over dryland.

The race was originally set up to irrigate five-eighths of each farm but many are far more developed than that.

He says there is enormous potential to irrigate other parts of New Zealand in a similar way to ensure security of water supply.

If the Spring flush from the Rakaia River could be caught and stored it would provide enough water for the whole of Canterbury for the whole of the season.

The only negatives are critics, like conservationists, who say taking water out of rivers interferes with fish life.

He answers that by saying if the irrigation scheme did not exist farmers would experience drought and there would be fewer people in Mid Canterbury.

"The devastation caused by drought is hard to describe if you have not experienced it," he said.

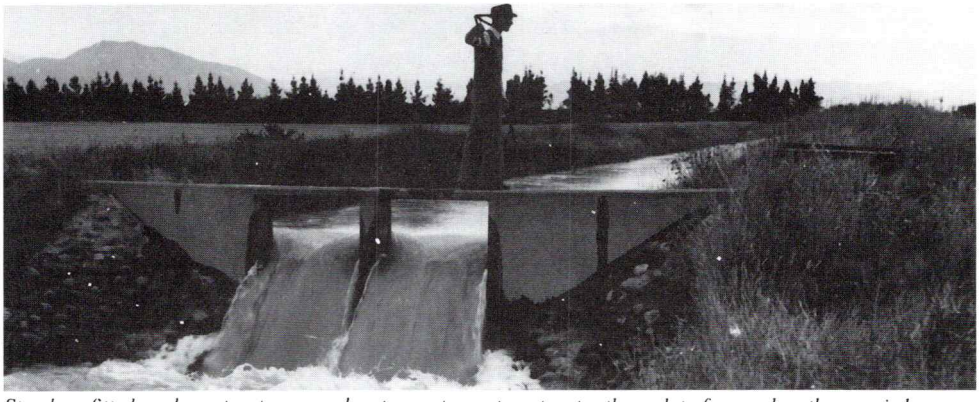
Economic Benefits of Rangitata Diversion Race

1. About 200,000 hectare of farmed plainsland in Mid Canterbury from the Pacific Coast to the Southern Alps foothills. About 1000 farm units in the district.
2. About 90,000 ha, or 45%, commanded by irrigation systems.
3. Rangitata Diversion Race schemes encompass about 64,000 ha (not all set up for irrigation, although the schemes are almost developed to capacity). The scheme was originally set up to irrigate five-eigths of each farm.
   Many are more developed that that.

Three schemes

Mayfield-Hinds	140 farms	31,988 hectares
Ashburton-Lyndhurst	160 farms	24,589 hectares
Valetta	40 farms	7,265 hectares

4. Mid Canterbury gross farm income approximately $200 million Average $1000 per hectareof $200,000 per farm (but a very wide range from top to bottom, $10,000 per hectare to $200 per hectare).
5. Gross farm income directly attributable to Rangitata Diversion Race irrigation conservatively estimated at $25.6 million (an additional $400 per hectare from 64,000 hectares).
   Plus an additional $5 million of gross farm income benefits dryland farms in the district (e.g. as source of feed, purhcase of livestock, etc.).
6. Economic benefit to Ashburton District (using multiplier effect of 4.5 (estimates range from x 3 to x8) x $30.6 million = $137.7 million annually - or $5,738 per head of population (based on 24,000 people).



Stop logs fitted on drop structures pond water upstream to get water through to farms when the race is low.

Competition for water keeps on growing

Competition for water has increased significantly in Mid Canterbury since the race was built, along with the costs of operating irrigation schemes.

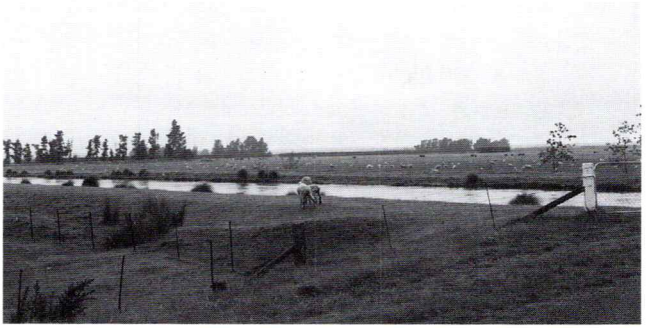
Competition has grown between users within irrigation schemes and between schemes and other users.

By the 1970s, farmers in the Ashburton-Lyndhurst scheme of the Rangitata Diversion Race were calling for upgrading.

The scheme, based mainly on border strip application methods, had been designed to irrigate only five-eighths of the irrigable area of each farm, 16,000 ha of the 26,000 ha area.

The area developed for irrigation had increased to the point where race water was fully committed.

A Ministry of Works report by J.C Bright and E. B. Williman in July 1987 said there was little seepage or operational byloss and suggested increasing the efficiency of water use by on-farm water allocation and distribution system operations during off-peak times.



A Race runs through Mid Canterbury

If systems are to be upgraded, a benchmark of current performance has to be identified along with areas with potential for improvement.

From 1979 to 1984 extensive watering trials were undertaken on most border-strip irrigation schemes in Canterbury to try to specify relationships between the main measures of border-strip application performance and variables such as slope, surface roughness, rate and duration of inflow border length and antecedent soil moisture.

They found the most cost-effective means of improving the efficiency of water use was to be consistently accurate in setting the duration of water flow to the border strip.

However, few detailed records of actual water deliveries to farms were available and water delivery appeared to be highly variable, by up to 20%, to some farmers. Flow recorders were installed on some properties.

Water supply agreements

Rangitata Diversion Race Management draws up agreements with race users, companies, societies or farmers, under the Irrigation Schemes Act 1990, for the abstraction of water from the race. The agreement provides for water to be drawn off at agreed points along the scheme according to a roster and fixed times.

Review of race organisation

Reviews of the overall management of the Rangitata Diversion Race to meet changing farming and community needs, streamline existing operational practices developed over 50 years and plan for the future, have been underway for some time.

The aim is to bring together the range of interested parties managing and using the race, their separate roles and present and future requirements, in a comprehensive management plan.

The Rangitata Diversion Race was operated by the Public Works Department and its successor the Ministry of Works and Development from 1945 to 1989 in accordance with a number of formal agreements, water rights and various established procedures and practices.

Since 1989 it has been operated by the Rangitata Diversion Race Management Ltd., a company wholly owned and operated by the users of the Race.

However, its full potential has never been realised and capital costs of large scale irrigation schemes are increasing. They trebled between 1945 and 1970.

Over the years, major reports have been made discussing past, present and future developments.

A 1970 report said the overall capital cost of the irrigation portion of the Rangitata complex as it existed at that time was around $176,000 per cubic metre per second, which, converted to 1970 costs, became $494,000.

Report calls for management plan for Race

In April 1987, an 80 page Ministry of Works report, Rangitata Diversion Race Management Plan. Background Discussion and Draft Recommendations for a Management Plan, recommended major restructuring of the management and financing of the Race.

At the time the Ministry of Works and Development had responsibility to manage and plan for use of water from the race, which was run on the basis of a collection of various written agreements, rights and practices.

Its objectives were to put in one plan the basis of the sharing of race water among existing users, to clarify water rights, agreements, operation and maintenance.

The report discusses ways of unravelling the nature and extent of existing water and stockwater rights and negotiating terms and conditions for future supply.

The inaugural meeting of the Rangitata Diversion Race interim board of management was held on August 13 1987 to formulate the board's role and financial aspects of its operation.

Board members were: Ashburton County Council R.S.Tasker, B.Dowrick, S. Goodwin; Ashburton Electric Power Board, G.J. Knight, E.D.Weir; Environmental Groups D.G. Thompson; Irrigation Schemes- Ashburton-Lyndhurst, J.C.Morris; Mayfield-Hinds, R.J.Bush; Valetta, D.T.Lowe; Ministry of Works and Development/Works Consultancy, K.B.McFall, D.Gardiner; Electricity Corporation New Zealand Ltd, M.J.France, J.F.Galambos, P.Wilson, A.Clifford; South Canterbury Catchment Board, Mrs A. P. Grigg.

During the year agenda items included voting rights and board membership.

Costs will never be same for irrigation

Ownership issues arose in early 1988 and the interim board moved a motion on February 4 1988 "believing that the assets of the RDR system are of national importance and believing therefore that they should remain under the ownership of the Crown, advise the Minister that this Board is prepared to manage and control these assets on behalf of the Crown and to this end are prepared to discuss the details of such an arrangement with your representative."

On March 10 three ownership options discussed with the Crown were to vest it in users or in a territorial authority and the "Crown would only be considered as a last resort."

At the same time, the government interest was vested in the Ministry of Agriculture and Fisheries which gave the board greater control, though the Ministry of Works and Development continued to operate it on a daily basis.

On April 21 1988 the board resolved that users form an incorporated structure and seek to take over the management of RDR. Mr France was elected interim board chairman. On August 11 1988 the Rangitata Diversion Race Management Ltd. was registered as a company. Directors were: G.J.Knight, M.J.France, J.P.Robinson, D.T. Lowe, R.J. Bush and J.F.Galambos.

On November 10 1988 the process of purchase from Treasury began and continued over several months.

Past Costs of Rangitata Diversion Race

(a) Gross Capital Costs	
Rangitata Diversion Race (1937-1945)	
Construction	$4,160,000
Less works for NZED only	$ 880,000
	$3,280,000
Less 33% for NZED winter use	$1,094,000
	$2,186,000
Ashburton-Lyndhurst (1936-1945)	
Construction	$ 996,000
Mayfield-Hinds (1938-1960)	
Construction	$1,764,000
Valetta Farm Settlement (1956-1958)	
Construction	$ 314,000
	$5,260,000
(b) Interest on 25% capital at 5.75%	
	$ 75,000
(c) Operation, maintenance and renewals:	
(net irrigation costs, 1960-1969 averages)	
RDR	$ 13,000
ALIS	$ 35,000
MHIS	$ 25,000
Valetta	$ 8,000
	$ 81,000
Renewals - Say	$ 19,000
	$ 100,000
(d) Total annual charges:	
Interest	$ 75,500
O & M and Renewals	$ 100,000
	$ 175,500

Board Members

Rangitata Diversion Race Management Ltd

From August 1988

Ashburton County Council/ Ashburton District Council	R.S.Tasker A.J.Rushton	Aug 1988 - Oct 92 Nov 1992 - present
Ashburton-Lyndhurst Irrigation Association/ Irrigation Society	J.C.Morris M.H.Lemon	Aug 1988 - Oct 93 Nov 1993 - present
Electricity Ashburton Ltd	G.J.Knight E.D.Weir	Nov 1988 - Apr 90 May 1990 - present
Electricity Corporation New Zealand Ltd	M.J.France J.F.Galambos A.C.McDougall G.W.Carson A.P.Dennehy V.Mavani J.P.Robinson R.J.McNickle	Aug 1988 - March 93 Aug 1988 - present Dec 1989 - Feb 96 Apr 1993 - Feb 96 Mar 1996 - present Mar 1996 - July 96 Aug 1988 - Nov 89 Sep 1996 - present
Mayfield-Hinds Irrigation Association/Mayfield-Hinds Irrigation Society	R.J.Bush A.O.Taggart	Aug 1988 - Aug 93 Sep 1993 - present
Valetta Irrigation Association/ Valetta Irrigation Co-operative Society	D.T.Lowe	Aug 1988 - present

On July 1 1989 the race was effectively purchased from the Crown and the interim board became the Rangitata Diversion Race Management Ltd. Board. in sole charge of the Race.

The board contracted management of the Race to the Ashburton-Lyndhurst Irrigation Society from August 1989 until August 1994 when the company employed its own staff and took over directly the control operation and maintenance. ALIS staff are still involved as a sub-contractor.

The actual date of purchase from the Crown was October 29 1990 and the date of financial settlement was August 14 1991.

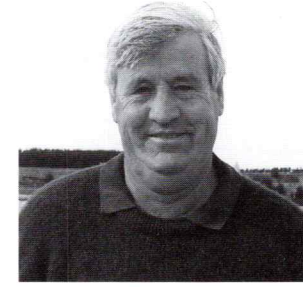
The crown's assets in the Race at the time of sale were $1,540,847, the historical capital cost and $2,085, 738 in accumulated liabilities.

The purchase price paid for the assets was $1. Water rates revenue of $257,368 was refunded. Net settlement by the Crown was $105,210 and debtors transferred to the purchaser amounted to $626,728.

Future development options under investigation include a storage dam with potential to provide security of water supply for farms during drought, a summer recreational lake, irrigation, power generation and to enhance Ashburton River flows. Blowing Point dam site has been selected for further study.

Chairman
Rangitata Diversion
Race Management Ltd

M.J.France	**April 1988 - Oct 1992**
J.C.Morris	**Nov 1992 - Oct 1993**
A.P.McDougall	**Nov 1993 - Oct 1995**
D.T.Lowe	**Nov 1995 - present**



David Lowe, RDR chairman

John Young, Company Manager

Staff & Management

Company Manager	**R. Stoker**	**Sep 1989 - July 1994**
	J.R.Young	**Aug 1994 - present**
Company Secretary	**E.D.Weir**	**Aug 1988 - June 1989**
	P.G.Smith	**July 1989 - present**
Racemen	**R.Guilford**	**Sep 1989 - July 1994**
	N.I.Stevens	**Aug 1994 - present**

Who owns The Race?

About 56 km of the 67 km Rangitata Diversion Race is located on a strip of land taken by proclamation for irrigation purposes under the Public works Act 1928.

The strip of land, ranging in size from 35 metres to 50 metres wide is Crown land.

The rest of the race, about 8.8 km crosses private land.

About 2.25 km crosses land for which the Ashburton District Council holds title and Highbank Power Station, settlement and farm are on land taken by proclamation for development of water power.

Totting up annual cost

The annual cost of Rangitata Diversion Race operation and maintenance in 1987 dollars (CCI $2,700) averaged about $200,000 over the previous five years.

Annual costs were shared between NZED and the irrigation schemes according to the average percentage of their water usage over the previous five years.

Four flow recording sites have been installed to provide the data.

Initially, ECNZ's share of costs, after Ashburton District Council and Electricity Ashburton have contributed, was above 50%.

By 1987 it had dropped to 41.9% compared with 58.1% for irrigation users as irrigation consumption increased.

Today ECNZ share 40% of the costs, Electricity Ashburton 5.1%, Ashburton District Council 0.9%, Mayfield Hinds Irrigation Society 26.6%, Ashburton Lyndhurst Irrigation Society 19.9% and Valetta Irrigation Society 7.5%.

Rangitata Diversion Race Company operates as a non profit making co-operative.

$78 million cost of new race

The cost of designing and building the Rangitata Diversion Race today, in 1996, could be $78 million.

Replacing the Surrey Hills siphon alone would cost $11,260,000.

The estimates were in a 1996 report by Tonkin & Taylor, 1996 Triennial Shutdown. Condition Assessment, Valuation and Risk Assessment.

The report says the race and structure were found to be "in generally good condition."

The main concerns are:

* Sedimentation in the race invert particularly downstream of the two intakes at Montalto Hydro Scheme and between the Methven checkgate and Highbank intake. Sediment is removed regularly but sediment associated with the two hydro schemes is likely to require removal.
* Grass growing at the race edge collecting silt from the water in its root system and building up a wedge of silt or grass as large as 1.2 m x 1.3m in places.

These silt wedges are likely to be reducing hydraulic performance of the race and occasionally slump into the race.

* Seepage from the race is evident in places. Seepages large enough to result in flowing water will be monitored.
* Erosion of the banks is occurring in places and requires attention.
* There is a perceived risk of landslides into the race in places which requires investigation.
* There is seepage through the embankment between the race and the Rangitata River, 100m down from the intake control gate. When the river is above 2000 cubic metre per second, water pours through the embankment into the race. There is a risk of this seepage causing failure of the embankment during floods.

The report says the race's hydraulic structures and the bridges are generally in good condition.

A preliminary assessment of the maximum probable loss to the RDR and surrounding land as a result of damage to the race from floods or earthquakes concluded that the maximum probable loss would result from a large earthquake causing a failure of an elevated section of the race embankment causing flood damage through Methven township.

The probability of this event occurring in any year has been assessed at about 0.001 (one in 1000 years). The resulting damage was estimated at between $3-10 million.

Studies of hydraulic modelling of the race and contingency plans to deal with disasters were recommended, along with studies of the potential for additional hydro electricity generation.

The report says the race's information and control systems need to be improved by constructing telemetered water level recorders and installing telemetry control on flow control gates to achieve optimal operation and reduce potential for damage from failure of the race.

"This would enable instant knowledge of the flow in the race and the ability to control the flow rate from a portable computer and telephone."

It would provide an early warning system to reduce the risk of damage to the race and surrounding properties on the event of a failure of the race.

Some RDR staff. January 1952. Back Row *(from left): D.M.Smith, I.J.Illing, C.W.Hartley, M.H.Broad, D.B.Nickalls, G.C.Martin, D.S.McCormick, E.G.Kelly, T.P.Staples, K.Stockdale, D.C.Burns*
Third row: *R.E.Hodgson, L.P.Waterreus, G.T.Bush, T.McGee, K.Hyland, C.K.Taylor, J.P.Barrett, S.G.Webber, L.H.Green, T.W.Browne, L.A.W. Griffiths, I.B.Hay, M.J.Burns, R.C.Hartley.*
Second Row: *R.J.Bennett, J.Hooper, C.H.Sumpter, F.H.McFarlane, D.C.Duff, O.D.D.Riddell, W.F.Young, I.W.McKinnon, E.T.Kensington, J.D.Usmar, C.L.Griffiths, H.B.Lockett, B.A.Brown.*
Front Row: *R.J.L.Duff, E.H.Hill, M.M.Reynolds, T.P.Timlin, R.T.Begbie, S.G.Lilley, G.C.Sargison, W.D.Lochhead.*

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Race Roll

Men and women who helped build or were associated with the Rangitata Diversion Race.
Every effort has been made to name everyone. However, any omissions are regretted.

Michael Savage,
Prime Minister
Bob Semple, Minister of Works and Development

Engineers
T. G. (Gordon) Beck
Bob Begbie
Trevor Kensington
John De Lambert
Fred Langbein
I.W. McKinnon
Jim Riddell
Ted Smith
Eric Thomson
Surveyors
Andy Patterson
Trevor Bush
Tom Satterthwaite
Operations & Maintenance Manager
Michael Burns
Overseers
Chris Burns
Ollie Magnus
Harold Hunter
Lance Turner
Foremen
Wally Bignell
Ken Orton
Dave Parker
Plant Overseer
Jock McNab
Shift Bosses
Trevor Barker
Don Campbell
Tony Rogatski
Lofty Gardiner
Men on Steam Dragline
Driver - Fred Foster
Fireman - Joe Madden
Floorman - Jack Bowers
Driver - Fagan McLachlan
Fireman - Laurie Moses
Floorman - Joe Stokes
Driver - Gardner Reid
Fireman - Scotty Campbell
Driver - Cyrus Christmas
Fireman - Mick Crowley
Driver - Ted Brinsden
Harley Gundry
Mechanical Shovel Operators
Dick Ellis, Springburn
Jack Greenlaw, Waimate
Bill Hopkinson, Temuka
Sid Lidstone, Timaru
Jim Kennedy, Kaikoura
"Hoopi" Osborne, Timaru
Bill Rooney, Timaru
Dragline Operators
Charlie Alexander, Mt Somers
Gordon Alexander, Mt Somers
Frank Atherton, Temuka
Dick Branch, Ruapuna
Ken Burgess, Mayfield
Owen Claridge, Timaru
George Frost, Mayfield
Jim Frost, Mayfield
Val Fulford, Christchurch
Eric Gillum, Temuka
Jack Hix, Mt Somers
Bill Hopkinson, Temuka
Keith Kenny, Ashburton
Bob McCready, ChCh.
Bob Middleton, Mt Somers
Laurie Moses, Ashburton
Charlie Napier, Springburn
Selwyn Osborne, Timaru
Freddie Rae, Ashburton
Ian Scott, Ashburton
Ron Skinner, Ashburton
Bob St Merat, Mt Somers
Kaahu Selwyn, Temuka
Brian Taylor, Temuka
Lloyd Tinker, Mt Somers
Len Vaughan, Methven
Fred Watts, Ashburton
Wattie Weir, Kaikoura
Selwyn Wilson, Methven
Lou Woods, Klondyke
Crane drivers
Jack Atherton, Temuka
Frank Keane, Timaru
Joe Madden
Jim Wolff, Mayfield
Bulldozer & Carryall Operators
Harry Bond, Temuka
Snowy Boulton, Temuka
Jum Broker, Ashburton
Harry Budd, Timaru
Alby Burrell, Temuka
Arty Campbell, Albury
Harry Campbell, Albury
Ray Canning, Ashburton
Laurie Cantwell, Albury
Reg Cantwell, Albury
Lou Collett, Pleasant Point
Mick Crowley, Timaru
Cliff Dabinette, Ashburton
Slim Davidson, Temuka
Ron Davie, Ashburton

Fred Fifield, Geraldine
Jack Gollan, Christchurch
Sid Goodwin, Methven
Charlie Heron, Geraldine
Johnny Hogg, Timaru
Bill Hopkinson, Temuka
Taz Hornbrooke, Temuka
Ernie Johnstone, Temuka
Doug Lamb, Staveley
Bert Leonard, Temuka
Jack McClintock, Temuka
Bill McGarva, Temuka
Jack McGee, Springburn
Mick McGuillon, W.Coast
Jock McLean, Christchurch
George McKenzie, Oamaru
Alan McLaren, Ashburton
Ossie McQueen, Sheffield
Jack Moffat, Timaru
Ivor Ralston
Bert Robinson, Ashburton
Len Robinson, Ashburton
Ted Sheppard, Methven
Bill Shierlaw, Dunedin
Brian Taylor, Temuka
George Twomey, Geraldine
Ted Twomey, Geraldine
Bill Watson, Timaru
George Wells, Rakaia
Fred Westphall
Charlie Wilson, Springburn
Harry Wilson, Orari

Offsiders for Shovels & Draglines

Tom Beaton, Temuka
Buster Browne, Temuka
Alf Emmerson, Ashburton
Ray Lower, Timaru
Stan Fergusson, Pleasant Pt.
Frankie Dick, Fairlie
Lloyd Langdon, Valetta
Tommy Simpson, Dunedin
Ernie Sherborne, Temuka
Nig Stills, Ashburton
Les Wilson, Christchurch

Athey Waggon Drivers

Harry Campbell, Albury
Bill Darcy, Timaru
Arnold Cross, Timaru
Jerry Hanafin, Temuka
Ernie Johnstone, Temuka
Bert Leonard, Temuka
Ernie Robertson, Temuka

Truck Drivers

Jack Atherton, Temuka
Gordon Day, Ashburton
Fred Douglas, Dunedin
Doug Knudson, Ashburton
Vic McClintock, Ashburton
Darkie Messan, Ashburton
Ross Watson, Ashburton
Eric Williams, Mayfield

Concrete Workers

Bob Thyne, Timaru
Ray Karst, Kaiapoi

Elevating Grader Operator

Laurie King Jnr. Mt Somers

Foreman Carpenter

David Parker, Winchester
Charlie Taipana, Temuka

Carpenters

Eric Bowers,Montalto Camp
Jack Boyer, The Birches
Jimmy Ellery, Mayfield
Ray Fox, The Birches
Morrie Jackson, Anama Camp
Les Hopkinson, Temuka
Les Long, The Birches
Herbie Williams, Temuka

Steelbender

Len Waterreuss

Blacksmiths

Hugh Scott, Ashburton
Stan McPherson, Timaru

Blacksmith Strikers

Jack Spencer, Temuka
Pat Cannon, Christchurch

Electricians

Leo George, Temuka

Pump Attendants

Jack Keenan, Fairlie
Charlie Rudge, Timaru
David Parker

Mechanic

Doug Bennett, Christchurch
Jock Burgess, Mayfield
Doug Elmsly, Christchurch
Fred Rae, Ashburton

Fitters, Turners

Manny Solomon, Temuka
Dobbin Manning, Temuka
Jock Burgess, Mayfield

Maintenance, Repairs

George Glassey, Tinwald
Des Lawrence, Springburn
Dick Manning, Temuka

Plumber

Tommy Dawkins, Timaru

Labourers

Morrie Barry, Geraldine
Henry Barnett, Temuka
Syd Drinkro, Christchurch
Tom Beaton, Temuka
Jack Driscoll, Temuka
Bill Eagle, Mt Somers
Pat Eagle, Mt Somers
Jim Fennesy, Timaru
Mick Geaney, Pleasant Point
Hapi Hokiango, Akaroa
Kone Hokiango, Akaroa
Webb Hopa, Temuka
Harry Jacobs, Kaikoura
Toby Jacobs, Kaikoura
Des Lawrence, Springburn

Race Roll (cont.)

Jack McClintock, Temuka
Roly Morgan, Akaroa
Big Paddy, Ireland
Peter Panirau, Akaroa
Bert Peck, Timaru
Bob Pohio, Kaiapoi
Kingi Rehu, Temuka
Moke Reihana, Temuka
George Robertson, ChCh.
Jim Reedge, Christchurch
Jim Rooney, Christchurch
Harry Smith, Christchurch
Alan Shrimpton, Timaru
Eric Smith, Christchurch
Jack Telpher, Anama Camp
Lance Templeton, ChCh.

Office Clerk

Ken Browne, Temuka
Don Seammel, Ashburton

Pay Clerks

Toffee Adams, Methven
Jim Usmer

Storeman

Hickey Stead, Springburn

Others

Tom Brown, Ashburton
Ken Burgess, Mayfield
Bert Curry
Reg Duff
Ted Hill
Len Hurst
Ben Lewis, Tinwald
Jack McPherson
Stan McPherson, Temuka
Jimmy Prendergast, Ashburton
Tommy Simpson, Dunedin
Jack Telfer, Anama Camp

Services, Contractors

George Meikle, grocer, Mayfield
Laurie King, butcher, Mt Somers
Mick O'Reilly, cartage contractor

School Teachers

Rona Norman, Christchurch
Miss A.M.Ferguson, Anama

Farmers

Frank & May Greenslade, Surrey Hills
John Greenslade
Bill Greenslade, Montalto
Ron Oakley, Mayfield
Arnold Rushton, Anama

Anama Married Quarters

Jack & Mrs Bowers; Mr & Mrs Boyer; Tommy & Grace Dawkins, Timaru; Morrie & Noni Jackson, Timaru; Ray & Myrtle Karst, Christchurch; Ivor & Mrs Ralston; Sandy & Iris Rose; Mr & Mrs Taipana, Temuka; Jack & Mrs Telfer, Ashburton; Len & Lil Waterreuss; Bob & Mrs Thyne, Timaru.

Montalto Married Quarters

Frank & Mercy Atherton, Temuka; Jack & Mrs Atherton, Temuka; Eric & Doss Bowers, Ashburton; Jum & Mrs Broker, Ashburton; Bill & Mrs Burnell, Dunedin; George & Mrs Campbell, Christchurch; Lou & Mrs Colett, Southland; Cliff & Mrs Courtney, Christchurch; Ron & Thora Davie, Ashburton; Fred & Mollie Douglas, Dunedin; Fred & Mrs Foster, Christchurch; George & Myra Frost, Mayfield; Ted & Mrs George, Christchurch; Jack & Mrs Greenlaw, Waimate; Bill & Glenys Hopkinson, Temuka; Tas & Mrs Hornbrooke, Temuka; Ernie & Esther Johnston, Temuka; George & Mrs McKenzie, Oamaru; Alan & Nip McLaren, Ashburton; Fagan & Mrs McLachlan, Southland; Dave & Mrs McLennan, Owaka; Joe & Mrs Madden, Christchurch; Laurie & Mrs Moses, Ashburton; Mr & Mrs Muldoon, Oamaru; Dave & Mrs Parker, Winchester; Ian & Mrs Scott, Ashburton; Mr & Mrs Williams.

The Birches Camps

Mick & Vera Crowley, Timaru; Hughie & Alice Scott, Ashburton; Mr & Mrs Watters, Christchurch.

Our Thanks

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We thank all the people who have given their time and shared their memories and knowledge so enthusiastically to help produce this history of the Rangitata Diversion Race.